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Subterranea

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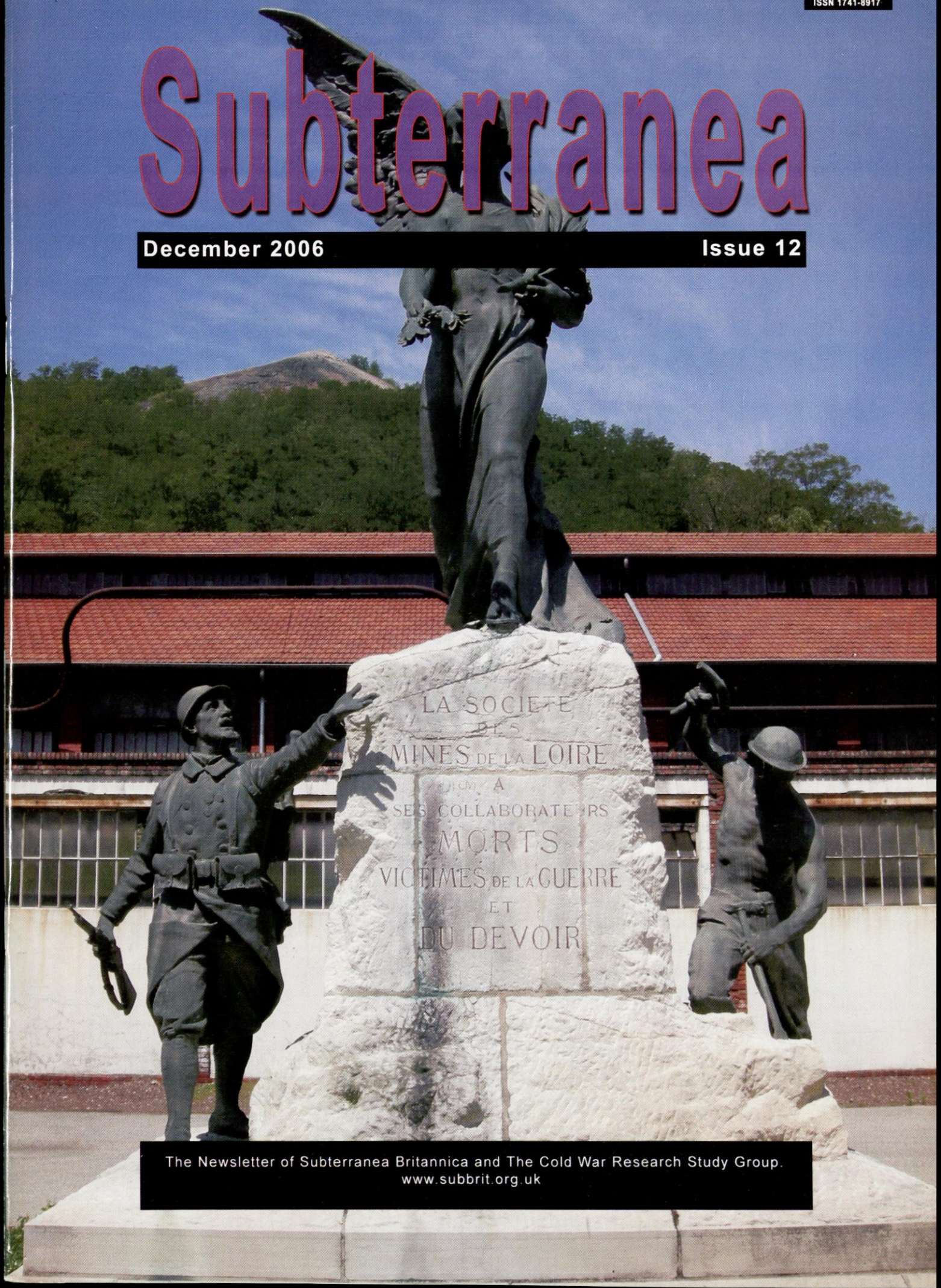

The Newsletter of Subterranea Britannica and The Cold War Research Study Group.
www.subbrit.org.uk

Subterranea Britannica is a society devoted to the study of man-made and man-used, underground structures and the archaeology of the Cold War. The main focus of interest is on abandoned and forgotten structures and, in the case of Cold War structures, studies are entirely confined to declassified and decommissioned structures.
The society is open to all and its membership includes all walks of life. Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.

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Front Cover Photo - The Memorial outside the Couriot coal mining museum - photo Martin Dixon. Rear cover - Top The underground firing range at the HASAG works in Altenburg. Bottom The Upper floor of the Soviet warhead store at Nobitz airbase - Photos Dan McKenzie

News

ARTICLES FROM THE ARCHIVES

Explosion at Whitehaven Colliery – 25 April 1882

In a report to Parliament in August 1882 Arnold Morley submitted his observations on the deaths in an explosion of four men, and injuries to a fifth, at the Whitehaven colliery, the workings of which extended 'far under the sea.' The Main Band Seam, in which the explosion occurred, had been worked out to the extent of some 3,000 acres or more, extending at one point some four miles from the bottom of the mine shaft. At some distance into the workings the seam is dislocated (downthrown) by a geological fault, beyond which the workings were known as the 'Countess District.' The lower level of this district was reached by a 'stone drift' or inclined tunnel through the fault, through ground lacking workable coal seams, and it was beyond this point that the explosion took place, in a passageway 208 yards long. Ventilation of the Countess District was at first by way of this stone drift alone. It was redirected, in time, by way of an independent airway taking a second tunnelled route back through the faulted ground. Before that return airway was established, ventilation was assisted solely by bratticing (half-brick thick brick walls to direct the air through the entirety of the workings) within the workings as first driven by way of the single drift. Early in 1882 a heavy fall of ground from the mine roof obstructed the new return airway. The earlier bratticing means of directing air had again to be resorted to. The intake air had already traversed 2½ miles of workings before it reached the stone drift, by which it then (at the date of the explosion) had again both to enter and to return. 'For two whole months,' it was reported, 'nothing seems to have been done to open up the blocked communication,' and at the end of that two months the explosion occurred. At the time, it was known that there was a considerable accumulation of gas [presumably methane] in the Countess District, and 'Geordie' lamps only were allowed to be used in that part of the mine.

Source: ANON, 2006, August 22 1882. Miners' air vent was two miles away. *The Guardian*, 22 August 2006, page 28.

The Elmstead Woods (or Chislehurst) tunnels, 1863 – 65 and 1902 - 03

Building the South Eastern Railway's Lewisham to Tonbridge line was commenced in May 1863 with a tunnel 650 yards long below Sundridge Park and Elmstead Woods. The tunnel was built longer than planned on the insistence of Mr. Scott of Sundridge Park, no contractors being allowed on his land. For the same reason the tunnel has no shafts and in places it is as little as four feet below the surface. The earthworks were completed in 1865 and the line was opened on 1 July in that year. The South Eastern Railway amalgamated with the London, Chatham and Dover Railway to form the South Eastern & Chatham Railway Company in 1898 and announced quadrupling of the track from St. Johns to Chislehurst in 1900. A new double-track tunnel was being driven alongside the original one in July 1902 when a part of the older tunnel partially collapsed, damaging the new one. Repairs took four months. A new station at Elmstead (later Elmstead Woods) was opened on 1 July 1904.

Source: Fred WHYLER, 1988, The Elmstead tunnel. *Bromleage*, Autumn 1988, page 1.

Caving recollections of Harry Pearman, Hon. Member Subterranea Britannica

Harry Pearman, known to most Subterranea Britannica members for his life-long cataloguing and publication (in numerous issues of the *Records of the Chelsea Spelaeological Society*) of the natural and (mostly) man-made 'caves and tunnels' of south-eastern England, has, with his wife Heather, written his reminiscences of and thoughts concerning 'wild' caving with the Chelsea society on its 50th anniversary.

Extracts are reproduced here:

The success of the club over the years is undoubtedly due to the often unsung heroic efforts of a series of individuals .. coupled with a number of institutional strengths such as:-

<u>The initial choice of Chelsea as a focal point for operations</u>

This was really an accident of geography but Chelsea was well placed as a convenient magnet for local cavers in the initial years. This of course was in the days when you could park a car in Chelsea!

<u>The Constitution</u>

The founder members can take the credit for this simple little document which set out the objectives, the management structure and democratic principles for running the Society. It has undoubtedly underpinned the organisation and has stood the test of time.

<u>The recognition of the exploration potential of Mynydd Llangattock</u>

Still a magical place to visit.

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The Newsletter

Providing a regular fix of CSS news.

The web site

Opening a new dimension of communication.

[Caving reminiscences]

Some of our 1950s equipment may seem a little strange now, such as the need to carry a packet of Rizla fag papers, a brown feather on the end of a piece of string, and a 4 inch diameter plastic funnel, but the essential requirements of caving are unaltered, namely the urge to crawl through mud carrying an entrenching tool.

Fred Topliffe and I may now be the only people who were present [at the 50th anniversary meeting] who can recall climbing on ladders made of hemp rope and hardwood rungs.

These weighed about five times the equivalent wire ladders and took up five times the space. Getting them to the head of a pitch sometimes involved unrolling them and allocating so many rungs to each member of the party to thread along the passages. Things did not improve on the return journey for the ropes could absorb water, which added to their weight.

Climbing them however was much easier. If they lay flat against a wall they acquired the characteristics of a rigid ladder and were therefore much better to climb than their wire equivalents. If they were free hanging you wrapped your arms around them in a bear hug and chomped up with both feet on one side. It was possible to slide a leg through the rungs and take the weight off the leg muscles and so take a rest at intervals.

Brigadier Glennie [Edward Aubrey Glennie [1889 – 1980]], a one-time honorary member of the Society, used to tell the story of his explorations of Indian potholes using an army of Indian assistants to carry rope ladders to sites and operate lifelines while he did solo descents. On one occasion he rested halfway up a pitch on a warm day and fell asleep, as did his lifeliners.

He woke up some time later and roused everyone by shouting and then continued the ascent. As a result he used to claim that he held the world record for sleeping on a ladder.

Hemp stretches when weight is applied and cavers had experiences of arriving at the bottom of pitches, stepping off the ladder, which then contracted and shot back up the pitch out of reach in the manner of a roller blind. I once climbed a 120 ft. rope ladder out of Bar Pot and, after going for some time, called out to my lifeliners that I was having a rest. I was startled when a voice in my ear enquired how I was doing. I was still at floor level, having done no more than take in the slack.

If for any reason you got stuck down a pot and had to wait for a rescue from above, then this was where the packet of fag papers came in handy, because you could cut bits off the hemp rope and smoke them!!!

The lighting of course was a carbide lamp, which produced a bright jet of flame about two centimetres long from the centre of your forehead. One fill of carbide and three fills of water would last for about three or four hours.

It is true that there was a danger of burning through your lifeline as you climbed, but this could be avoided with some care.

If the cave was dry and you ran out of water you could always undo the top of the water chamber and pee into it. You might say this tactic would work well for men, but what if you were a girl. Well this is where the 4 inch diameter funnel came in handy.

The brown feather on the end of a piece of string was used for weather forecasting. Before you went to sleep you hung it up just outside the door, and in the morning it was the first thing you looked at.

If the feather was dry it was fine, and if it was wet it was raining.

If the feather was vertical it was calm, and if it was horizontal it was windy.

If the feather had turned white it was snowing, and if you could not see it at all it was foggy.

This method is absolutely infallible.

Unless some magic pill is invented it is likely that Heather and I may not be able to attend the centenary celebrations in 2056. However, we do intend to hang around until some connections are made between the four great caves at Mynydd Llangattock, a feat which seems well within the capabilities of the current core of active members.

Source: *Newsletter Chelsea Spelaeological Society* 48(10), 92 – 93 (2006)

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NEWS – ARCHAEOLOGY

High Pasture Cave, Isle of Skye: entrance to the Underworld?

Excavations in the entirely natural High Pasture Cave, near Torrin on the Isle of Skye, have revealed a 1.2m depth of archaeological deposits containing material dated from 1200 BC (mid Bronze Age) to 200 BC (late Iron Age.) At about the latter date the shaft leading down to the cave passage was deliberately back-filled with structured deposits containing quern stone fragments, evidence for iron and copper smelting, stone tools, and antler and bone pins. At several levels the remains of peat fires were identified on stone slab hearths surrounded by offerings, and those of inhumation burials. For further information visit www.high-pasture-cave.org

Source: Martin WILDGOOSE, and Steven BIRCH, 2006, High Pasture Cave: entrance to the Underworld? *Current Archaeology* 18(1)(205), 6 – 7.

A new ossuary created at Kellington, Yorkshire

Some 700 human skeletons have been excavated for archaeological study at the church at Kellington, Yorkshire. Local feeling dictated that these should in due course be re-interred as close as possible to their intended final resting place. For future archaeological research it was desirable that the material should remain readily accessible for further study. A solution has been arrived at whereby a new ossuary or accessible storage chamber has been created for them below the ground floor of the church tower.

Source: Harold MYTUM, 1997, Reinterment of human remains: the Kellington solution. *Church Archaeology* 1, 50 – 51.

Bones from more than 1,000 persons found wrapped in togas in a Roman Catacomb, Italy

Archaeologists exploring one of Rome's oldest catacombs are baffled by neat piles of bones from more than 1,000 skeletons dressed in elegant togas. The tomb has been dated to the first century AD, and represents the first known example of mass burial. The presumed upper class Romans would, in the normal course of events, have been cremated at that time. The bones bear no evidence of physical violence. Tests are underway to attempt to detect evidence for an epidemic or some natural disaster.

Source: ANON, 2006, Bones in togas baffle archaeologists. *Kent Archaeological Review* 165, page 116.

Oldest known frescoed burial chamber in Europe discovered near Rome, Italy

A tomb raider has led Italian archaeologists to what has been identified as the oldest frescoed burial chamber in Europe, in a field to the north of Rome. The robber, on trial for trafficking in hundreds of illegally excavated antiquities, revealed the location in the hope of gaining leniency from the courts. The chamber, which has been called the Tomb of the Roaring Lions, dates form around 690 BC, and belonged to a warrior prince from the nearby Etruscan town of Veio. It is decorated with depictions of birds and ferocious lions, and thought to be at least a century older than other such Etruscan tombs.

Source: ANON, 2006, 'Tomb raider' reveals burial chamber. *Kent Archaeological Review* 165, 114 – 115.

Archaeology of a lead mining district in Scordale, Cumbria, and the Ministry of Defence Warcop Army Training Area: a surprise discovery

In April 2005 a group of archaeologists from Defence Estates, English Heritage, and Cumbria County Council made a reconnaissance survey of the lead mining complex (Scheduled as an Ancient Monument) on the MoD Warcop Army Training Area. The historically important mines area extends some three kilometres along the steep slopes of Scordale, a remote and rugged valley. Mining relics include shafts, spoil tips, trackways, and the remains of ore processing buildings. Seasonal flooding of the Scordale Beck is causing erosion of the valley sides and endangering the mining remains. The features most at risk have been assessed, with a view to their preservation by record before they disappear. Aerial photography has been commissioned to assist surveying of the difficult terrain. The resulting 'orthophoto' constitutes an extremely accurate digital map of the valley. Detailed archaeological recording of the individual mining features perceived to be most at risk is to follow.

As Warcop is an intensively used training area, the availability of two- or three-day 'safe' periods for surveying work is limited.

An intriguing early result of the ground survey is the discovery of a fragment of a flat stone on which, seemingly, is engraved a part of a drawing of an animal (the 'stone beast.') Debate continues as to whether or not this is a genuine human artefact and, if so, what the missing part of the depiction might look

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like, and indeed what exactly the surviving part represents – an animal, a human being, or what. A date in the 1st to 11th century range has been suggested on stylistic grounds – perhaps Roman, Pictish, or Viking. The mining operations date only from the 18th – 19th centuries.

Source: Philip ABRAMSON, 2006, Lead mines and stone beasts. *Sanctuary [The Ministry of Defence Conservation Magazine]* 35, 4 – 45.

Surrey Archaeological Research Framework: importance of east Surrey's underground mines and quarries acknowledged

Previous reviews of the archaeology of Surrey have generally overlooked such important elements of the county's history as the underground quarrying of Reigate stone, a material widely used in prestige work in the great majority of the most important Conquest to post-medieval buildings in London and the Home Counties. Recently, indeed, firm evidence for Roman quarrying for this material has been found at Reigate.

In other respects, the industrial archaeology and history of Surrey have been better-recognised than in many counties. From the 17th to 19th century antiquarian authors to the early 20th century Victoria County History, Wealden glass- and iron-making, fullers-earth mining, lime-burning, and the construction of horse-drawn iron tramways, for example, have been relatively well investigated and reported in print. And under the oversight of the Surrey Industrial History Group (a section of the Surrey Archaeological Society), for example, Surrey's important gunpowder and paper-making industries have been researched using both archaeological and historical methods.

Many years of work on archaeological and topographical surveying in the underground quarries at Merstham and Chaldon, and supporting archival and historical research, undertaken by members of the Wealden Cave and Mine Society and Subterranea Britannica, are now increasingly recognised by the mainstream archaeological community and its publications. It has even proved possible to persuade at least two Inspectors of Ancient Monuments to go underground! English Heritage have acknowledged the Merstham-Chaldon complex of 17 kilometres of quarry tunnels as of national importance, fully deserving Scheduled Ancient Monument designation, although if or when that may be implemented is at present an open question. And the annual research conference of the Surrey Archaeological Society now often includes presentations on advances in industrial archaeology, subterranean or surface.

The *Surrey Archaeological Research Framework* seeks to record what is already known of the archaeology of Surrey, to identify important gaps in knowledge, and to consider priorities and means to make a completer picture of the county's past.

Source: David G. BIRD, 2006, Surrey Archaeological Research Framework 2006: providing the foundations for future archaeological work in Surrey. Surrey County Council / Surrey Archaeological Society: 83pp
[www.surreyarchaeology.org.uk]

NEWS - MINING

Accidental death at Stoke Hill stone mine at Limpley Stoke, Wiltshire

The Stoke Hill stone mine (historically better described as an underground quarry for Bath stone) at Limpley Stoke was the scene of a tragic accident on Wednesday 20 September 2006. Steven Cosh (38) was trapped below a stone which fell from the mine ceiling where he was operating the large electrically driven saw used to cut stone into smaller pieces. The fallen stone, estimated to weigh about a tonne, trapped the victim's legs and lower abdomen. Colleagues lifted the stone, and the victim was transferred to hospital where he subsequently died.

The mine, which Subterranea Britannica members visited during the 2006 Study Weekend, has an exemplary safety record. Although the mine was closed for a day or two after the accident as a mark of respect for the miner and his family, it was given the green light to continue operating by the Health and Safety Executive. Messages of condolence have been sent from Subterranea Britannica.

Source: Bath / *Bath Chronicle* website http:// thisisbath.com [Sent in by Martin Dixon]

History of Anglezarke lead mines near Bolton, Lancashire

A recent article in *Industrial Heritage* outlines the history of lead mines at Anglezarke Moor, Lancashire, from the discovery of galena there in about 1690. There is an accompanying map and section.

Source: B. JONES, 2006, Anglezarke lead mine. *Industrial Heritage* 32(2), 30 – 36.

News

Skaergaard (Greenland) mining plans abandoned

Ambitious plans to develop a massive metalliferous mining complex at the Skaergaard igneous intrusion on the east coast of Greenland (reported in *Subterranea* 9 (2005), 5 – 6) have been abandoned by concession-holder Galahad Gold. Mining here may be reconsidered in the future, when metals prices are more favourable for the profitability of the project. Gold and palladium were to have been mined, with titanium- and vanadium-rich magnetite crucial to financial success. However, it seems that at current market prices the ores are too lean to support the large capital costs for such a project.

Source: Kent BROOKS, 2006, Skaergaard mineral exploration ended. *Geology Today* 22(5), page 169.

NEWS – MILITARY

Mount Weather US Government bunker, Virginia USA

What may be the US Government's most secret underground bunker complex, in the mountains in Facquier County, Virginia, 75 miles to the west of Washington DC was the subject of an article in *The Guardian*'s *G2* section published on 28th August 2006. It is speculated that it forms and contains a parallel or alternative 'state' and parallel administration ready to assume control of the country in the event of nuclear war or devastating terrorist attacks. An accompanying air photograph shews three or four large surface sites linked by a zig-zag highway and, it is claimed, tunnel entrances in the mountainside. The place is officially known as the Emergency Operations Centre of the Federal Emergency Management Authority (FEMA) and is thought to date from the Cold War, and to have found a new lease of life after the 9/11 attacks.

The article describes what was visible around the perimeter of the 500 acre site, and what (little) could be learned from people living nearby. One informant claimed that on one occasion 'the whole mountain opened up and Air Force One flew in – and it closed right up.'

Source: Tom VANDERBILT, 2006, Is this Bush's secret bunker? *The Guardian G2*, 28 August 2006, 12 – 15 [includes an aerial photograph]

NEWS - MISCELLANEOUS

Friends of Williamson's Tunnels to celebrate 10th Anniversary in Liverpool

The Friends of Williamson's Tunnels were established in Liverpool in the Autumn of 1996 to investigate, research, restore, and gain public access to the extraordinary tunnels dug into the red sandstone of Edge Hill by Joseph Williamson [1769 – 1840] in the early years of the 19th century. Subterranea Britannica members may remember the FoWT presentation at a day conference a few years ago, and our Study Weekend hosted by that body in Liverpool which, as well as the tunnels, took in the Mersey Road Tunnel, the Liverpool Overhead Railway tunnel, and much else besides.

The Friends' latest newsletter, *The Mole*, carries news of their recent work. Ownership of the Smithdown Lane 'Stables site' appears to have changed hands, and planning permission for a three-storey residential development has been renewed. Building here might be problematic if, as is believed, the large 'triple-decker tunnel' lies below the land. And a residential block might quite obscure the now established tunnels heritage centre, where a glass wall encloses one of the larger tunnel entrances which gives access to a public underground circuit.

Work and planning permissions at the nearby Paddington site are discussed. Large parts of the tunnels here are still filled with demolition rubble, which it is hoped to remove And the grave of Williamson himself has been rediscovered in the tarmac-covered graveyard of the former St. Thomas' Church. He died aged 71 on 1st May 1840.

For more information about the Friends, visit www.williamsontunnels.com or they can be Emailed at info@williamsontunnels.com (general enquiries), memberships@williamsontunnels.com (membership) or shows@williamsontunnels.com (for presentations) Or you can write to them at Friends of Williamson's Tunnels, 15 -17 Chatham Place, LIFVERPOOL, Merseyside, L7 3HD.

Source: FRIENDS OF WILLIAMSON'S TUNNELS, 2006, *The Mole* 17 (June 2006)

Woman aged 85 trapped in Swiss bank vault

An eighty-five-year-old woman was accidentally locked in a bank vault where she was reading some of her documents placed on deposit, and remained motionless (presumably in complete darkness) for some four hours. Eventually her presence was detected by motion sensors in the vault, an alarm was raised, and she was released. It seems that the vault was locked at closing time, so presumably staff had to be called out with keys to open the bank as well as the vault.

Source: ANON, 2006, *The Guardian*, 10 August

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Burlington for sale

Most people who drive up Hawthorn Hill (near Corsham, Wiltshire) towards the Post Office are unaware that they are driving over a vast 35-acre underground bunker, which spreads beneath the fields and buildings a long distance to either side of the road. It started its existence as Spring Quarry, one of the many local underground stone quarries. Some of these quarries are still at work, such as the one opposite the entrance to Katherine Park in Corsham, and Monks Quarry near Gastard. But Spring Quarry was taken over many years ago by the Government, and in the 1950s was developed as an underground centre, to be used in the event of a nuclear attack on Britain by the USSR. It was nicknamed 'Burlington,' though for many years the Government denied in public that it existed at all. It was to have been the site of the main Emergency War Headquarters, and was blast-proof. It contains over 60 miles of roads and contains the second largest telephone exchange in Britain. It is now up for sale and its interior has been much photographed. For more information and pictures see:

http://bbc.co.uk/wiltshire/content/articles/2005/12/14/burlington nuclear bunker feature.shtml

http://www.chocolatechipsdesign.co.uk/nettleden/springquarry/index.shtml

Source: Owen WARD / M. PRIOR, 2006, Burlington up for sale! *Neston News*, June 2006.

Underground (under seabed) storage of carbon dioxide

The British Geological Survey, alongside its investigations into the question of deep nuclear waste repositories, is also investigating the long-term (with luck 'permanent') storage of excess carbon dioxide, one of the 'greenhouse gases' threatening our planet as a result of our extravagant life-style. Under the right pressure and temperature conditions, carbon dioxide will combine with water to form solid crystalline hydrates. Large areas of the European continental shelf and adjoining seas, and much of the Mediterranean, are seen as potentially suitable for the formation of deep geological repositories for storing unwanted carbon dioxide trapped in ice-like hydrate crystals.

Source: Ameena CAMPS, 2006, Trapped in ice: Ameena Camps investigates carbon dioxide hydrates – a new way to store carbon dioxide underground in a cage of ice. *Planet Earth*, Autumn 2006, 28 – 29 [Published by the Natural Environment Research Council]

NEWS – NEW PUBLICATIONS AND REVIEWS

Caves and tunnels in South East England: Part 17

The seventeenth part of the series *Caves and tunnels in South East England*, edited by Subterranea Britannica's Honorary Member Harry Pearman, has recently been published as volume 32 of the *Records of the Chelsea Spelaeological Society* (doubling up as the *Annual Report of the Kent Underground Research Group* for 2004/05)

This contains Harry's and other contributors' latest collection of bits of information and plans of sites of all kinds in and around London and the south-east.

The main sites featured include the underground chalk quarry tunnels at Quarry Street, Guildford (Surrey), a denehole at Northfleet (Kent), the 'Rabbit mine' in the Upper Greensand at Godstone (Surrey), an underground air-raid shelter at Kent International Airport at Manston, the short-lived coal mine at Cobham (Kent), tunnels at Eltham Palace (SE London), a survey (by Nick Catford) of the surviving surface remains of the Kent Coalfield mines, the Shell Grotto at Margate (Kent), plans of the upper and lower floors of the Paddock Bunker at Dollis Hill (NW London) and numerous other sites.

Details and prices of earlier issues in this series can be found at http://www.chelseaspelaeo.org.uk ; source material is deposited in the library of the William Pengelly Cave Studies Trust Ltd – see http://pengellytrust.org.uk

Details: Harry PEARMAN, 2006, Caves and tunnels in south-east England. Part 17. *Records Chelsea Spelaeological Society* 32 / *Annual Report Kent Underground Research Group* 2004/05: ii + 51pp [Available at £ 6 inclusive of postage and packing from J.M. Cooper, CSS Publications Officer, 31 Elm Close, WELLS, Somerset BA5 1LZ (T) 01749-670568 / Email: johncooper111@btinternet.com]

Cape Cornwall mine

The latest issue of *British Mining [Monographs of the Northern Mine Research Society]* is entirely devoted to the history, geology, and archaeology of one of Cornwall's smaller former tin mines, located on the coast a little to the north of Lands End. This volume contains historic illustrations, maps, and photographs, and is based on fully referenced extensive archival and historical research supported by surface archaeological investigations, and has an index.

For further details of the Northern Mine Research

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society and its publications visit www.nmrs.co.uk and for the purchase of publications contact NMRS Publications, John Hunter, 3 Leebrook Drive, Owlthorpe, SHEFFIELD S20 6QG (Email miner@aditlevel.co.uk)

Details: Peter JOSEPH, 2006, Cape Cornwall mine. *British Mining* 79: 112pp [ISBN 0-901450-60-X]

A new book on World War I military mining: Flanders in world War I

Peter Doyle, an established author on World War I military geology with several books and papers to his name in that area, has collaborated with Peter Barton (Secretary of the All Party Parliamentary War Graves and Battlefields Heritage Group) and Johan Vandewalle (a tunnel-exploring native of Zonnebeke) in the production of what has every appearance of being the ultimate definitive volume on Great War military tunnelling by both sides at the Western Front.

This is a profusely illustrated hardback volume containing the results of some 25 years research into military tunnelling, both sides of the front line, in the Ypres salient. Two-and-a-half years of offensive tunnelling on the Allied side culminated in the detonation of a number of mines under the Messines ridge on 7 June 1917. One of the placed charges exploded, some 38 years late, on 17 July 1955; and another is thought still to remain unfired! As well as describing what is known and what can still be seen of the offensive mine and countermine tunnels, due attention is also given to the hundreds of dugouts of all sizes which sheltered the combatants and their effects. Relatively little is said about the not very successful use of tunnel-boring machines whether worked by compressed air or electricity. But there is much detail on tunnel-digging by hand, spoil extraction and disposal, drainage by pumping, ventilation, and lighting underground.

The illustrations include maps, trench plans, plans and sections of tunnel and dugout systems, contemporary and modern views above and below ground, equipment, technical construction details, geological maps and sections, and personnel. Importantly, German as well as Allied sources have been drawn upon.

There is a three-page list of sources, a further three pages of bibliographical references, and a four-page index.

Details: Peter BARTON, Peter DOYLE, and Johan VANDERWALLE, 2004, *Beneath Flanders fields: the tunnellers' war 1914 – 1918*. Staplehurst: Spellmount Ltd: 304pp [ISBN: 1-86227-237-9] [£25

Geology of the Wirksworth metalliferous mines, Derbyshire

Trevor Ford, an academic geologist with a long and distinguished record of published work on economic geology, especially the geology and history of geology of metalliferous ores and industrial minerals in and around Derbyshire, has produced a paper on the geology of the Wirksworth mines which has been published as the whole of the latest issue of *Mining History*, the *Bulletin of the Peak District Mines Historical Society*, jointly with the East Midlands Geological Society.

The rock sequences within, largely, the Carboniferous Limestone, and the mineralised veins and faulting in the south-eastern corner of the White Peak between Cromford and Wirksworth are described. The mineralisation is principally galena (a lead ore), with calcite, barytes, and some fluorite. There are also 'toadstones' or sheets of basalt lava interbedded with the sedimentary limestones and shales in the area.

Observations of stratigraphy, veins, and faulting are reported from mine shafts, stopes, levels, soughs, surface exposures, and from within the recently closed Middleton limestone mine. The paper is profusely illustrated with colour plates of underground locations, and geological and mining maps and sections. Especially noteworthy is a large colour photograph on the front cover of two superimposed levels of working, on an impressive scale, within the limestone mine, although the text is primarily concerned with metalliferous mining not chemical limestone. A comprehensive list of references to relevant earlier published work occupies two pages of this important 42 page paper. Although this is the issue 'for winter 2005' it was in fact published in 2006, a fact not explicitly recorded within the publication, although the listed references include papers published in the latter year.

Source: Trevor D. FORD, 2006, *Mining History [Bulletin Peak District Mines Historical Society]* 16(2) (for Winter 2005): (2) + 42pp.

New guide published for the Dorking 'caves', Surrey

The largest of the 'caves' at Dorking, entered via a doorway to one side of the War Memorial in South Street, is regularly open to visitors, although visits (normally on the second Sunday each month) have to be pre-booked at the Mole Valley Visitor Information Centre, Dorking Halls (telephone 01306-879327.) These are of course not natural caves but, like those at Reigate, man-made excavations into the Folkestone Sand. Dorking's main 'cave' incorporates

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rock-cut wine-cellars linked with a mysterious deep shaft and flight of steps down to a small circular room with a seat around part of the circumference – interpreted by some as a cock-pit.

Professor R.C. Selley (Emeritus Professor of Geology at Imperial College) has written a new guide-book explaining the geology, archaeology, and history of the 'caves' which is available for £ 1.50 at the Information Centre. A somewhat cheaper and more accessible publication than Dick Selley and Ian Plimer's five-volume *Encyclopedia of geology* published by Elsevier in 2004!

Details: Richard Curtis SELLEY, 2006, *Dorking caves guide*. Dorking: Petravin Press (for Mole Valley District Council): 12pp [ISBN 0-9547419-1-9]

Subterranea - the journal of Sociètè Francaise d'Ètude des Souterrains – issue 138 (June 2006)

The latest issue of the journal of our sister society in France, also *Subterranea*, contains the following articles:

ANON, 2006, Le Souterrain de Saint Mamet (n° 1) – Commune de Saint Mamet (Cantal) *Subterranea* 138, 47 - 49 [Rock-cut souterrain – includes photographs and plan]

SOSSON, C., A. DEVOS, O. LEJEUNE, and G. FRONTEAU, 2006, Les "creutes"; carriers souterraines entre Reims, Laon et Soissons. *Subterranea* 138, 50 - 62 [Underground building-stone quarries between Reims, Laon and Soissons: includes a location map, geological maps and sections, quarry plans, and photographs including graffiti]

USSE, Jean Philippe, 2006, Souterrain (n° 2) de Saint Mamet – Commune de Saint Mamet (Cantal) *Subterranea* 138, 34 - 46 [Rock-cut souterrain – includes photographs, plan and sections]

World War II German military tunnels in Poland

Published in 2002, a new book (entirely in Polish) deals with a cluster of, it seems, seven World War II German underground bunkers, of which five are close to Walim, one is further north, to the north of Wałbrzych, and one further south, to the north of Klodzka. Wałbrzych, in Lower Silesia, is some 30 km south-west of Wrocław, and the majority of the bunkers quite close to the Czech border. With the help of a pocket dictionary and a Polish bar-maid, I think the title translates as something like 'On the trail of the biggest secret (or mysterious) bunker of the Hitler era.' When your reviewer was in this area in 1999, he visited one or two of the unfinished German tunnelled works (open to the public) near Walim. There seemed to be an idea that this cluster of five was intended to be linked together into one huge complex, although in fact none of the five sites as abandoned is very extensive on its own.

The book contains a number of poorly reproduced photographs, maps, and plans of bunker tunnel systems which would be hard to read even if in English.

The several 'kompleks podziemny' (underground complexes) include:

Głuszyca	IV/6080
Osówska	IV/6081
Rzeczka (Walim)	IV/6082
Włodarz	IV/6083
Jugowice Górne	IV/6084
Zamek Kziaz	IV/6085

Details: Jacek M. KOWALSKI, J. Robert KUDELSKI, and Zbigniew REKUC, 2002, *Tajemnica "Riese": na tropach najwiekszej kwatery Hitlera*. LODZ: Biuro Odkryc: 252 + 19 pages [ISBN 83-915498-6-0]

NEWS – SITE VISITS AND INVESTIGATIONS

Reigate Fort, Surrey

Reigate Fort was visited by Paul Sowan, Malcolm Tadd, and John and Rosemary Collett on 16 September 2006, attending a guided tour arranged by the National Trust, who own the fort.

The structure, not strictly speaking a fort but a defensible stores depot and mobilisation centre, was built in 1898 to counter a possible French invasion, and is one of 13 such structures built in an arc around the east, south-east and south-west of London in the 1890s. The forts built were at North Weald (Essex); Farningham, Halstead, and Westerham (Kent); and Woldingham, Fosterdown (Caterham), Merstham, Reigate, Betchworth, Box Hill, Denbies, Pewley Hill, and Henley Grove (Surrey.) They went out of use in the early years of the 20th century, although were perhaps used again as stores during the First and Second World Wars. The Merstham Fort (otherwise known as Alderstead or Merstham East) is one of two intended either side of the Merstham Gap, to guard the main Brighton Road and railway lines; a corresponding Merstham West Fort had been intended, but was never built. One fort (Halstead) remains in military ownership and use; at least two (Box Hill and Reigate) are now owned by the National Trust; several others are in

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private ownership, that at Woldingham now forming the basement of a private house built on top of it.

There appears to be no standard pattern for the forts. Those hitherto known first-hand to your reporter (Box Hill and Fosterdown) being unlike Reigate or each other.

The Reigate fort is the largest of the thirteen, and is sited strategically on the crest of the North Downs overlooking the town to the south, and the main road to London via Sutton (A 217) up Reigate Hill.

The main fort (a Scheduled Ancient Monument) comprises an elongated oval site aligned east-west, in which an encircling ditch and earthen rampart contains one surface building (the former tools store), and three semi-sunken earth-covered buildings. A system of granite sett lined channels was provided to collect rainwater runoff into a concrete lined tank. The single entrance on the north side has two sets of iron or steel gates, the outer set being replicas of the originals, and the inner set the original gates. The former caretaker's cottage, to the east of and outside the fort enclosure, is now in private occupation.

The objects of interest encountered within the inclosure are, from east to west, as follows:

(1) The flat-roofed single storey tools store – a brick-built surface building with a concrete ceiling on iron or steel supporting girders (now restored);

(2) The semi-sunken earth-roofed magazine containing two chambers for the storage of ammunition and gunpowder (now restored with original timberwork and iron fittings); interestingly, although these chambers have glass-fronted sconces (recesses) for open-flame lamps, there is no perimeter lighting gallery such as is found at the Box Hill fort which has three magazine chambers accessed by a cut-and-cover tunnel which of course made artificial lighting essential);

Access beyond this point to the water tank, 'parade ground', and two 'casemates' is by way of a chicane between the outer wall of the magazine and the northern rampart.

(3) Semi-sunken earth-roofed eastern 'casemate' containing two storage chambers entered via a low-level pathway open to the sky accessed by steps at each end (now restored);

(4) A second similar western 'casemate' (not currently accessible as a former occupant of the site has back-filled the lower parts with earth and / or rubble.)

Although the National Trust refers to these two structures as 'casemates' they appear to have been more in the nature of store-places, and were certainly not equipped with embrasures from which weapons might have been fired. The *Oxford English Dictionary* defines a casemate as (1) a vaulted chamber built in the thickness of the ramparts of a fortress, with embrasures for the defence of the place; or (b) a bomb-proof vault, generally under the ramparts of a fortress, used as a barrack, or a battery, or for both purposes.

The only provision for firing from the Reigate fort is the fire-step around the inner edge of the ramparts. There is no evidence that the 'casemates' were intended to be used as barracks as there is no trace of any provision for ablutions, meals, or sanitation in the structures currently accessible.

Gates and railings, metal window fittings, and internal oak doors have been restored in the eastern structures, and health and safety issues addressed. The work was supported financially by Biffaward, the Heritage Lottery Fund, and Norwich Union.

The formerly extensive views from the ramparts are now largely obscured by mature trees which, being within a Site of Special Scientific Interest (SSSI) cannot be felled.

At the western end of the grass-surfaced 'parade ground' (as the National Trust calls it) are two large earth mounds of unknown purpose. These may have been the butts of a rifle range, although no traces of bullets have been found. The National Trust booklet (details below) suggests that the space may have been intended for pitching tents if or when required. Of course, France did not invade, and the 'forts' were never used as at first envisaged. That at Reigate has been occupied by a local scout troop for some years between the wars and after World War II, and it seems also by a building contractor.

The surface parts of the fort are publicly accessible, and there is an interpretation board outside the outer gate. Guided tours of the accessible buildings (which are kept locked to prevent the interiors from vandalism) are organised from time to time by the National Trust (telephone 01372-220640) – these are free for National Trust members, with a charge of £3 for non-members.

An explanatory free leaflet, and an illustrated booklet (£1) are available during these guided tours and,

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presumably, can be obtained at the NT Information Centre at Box Hill, where the exterior of another fort can be viewed.

Source: ANON, 2006, Reigate Fort revealed. *National Trust South East News*, Summer 2006, page 3.

Source: Victor T.C. SMITH, 1975, The London Mobilisation Centres. *London Archaeologist* 2(10), 244 – 248.

Source: Victor T.C. SMITH, 2006, *Reigate Fort: the defence of London*. National Trust: 24pp.

The Crowborough Brickworks tunnel at Jarvis Brook, East Sussex

A large brickworks to the southwest of Crowborough Station (which is in fact at Jarvis Brook) took clay from open pits either side of a footpath running from Farningham Road (at the station) to Mount Pleasant. This footpath runs along a ridge of high ground, the level having been lowered on either side in excavating clay for brickmaking. The two pits, north and south of the path, were linked by a small tunnel below it, at TQ 351296, the position of which can readily be seen from the footpath. This short tunnel is presumed to be blocked, although the northern portal possibly forms a feature of a private garden. The approach to the location of the southern portal, now within an industrial estate, can be seen to be overgrown. The location is easily recognised by the survival of a brick parapet on the south side of the footpath, noted by Paul Sowan on 14 August 2006. The bricks of which this is built are presumably those made at the works.

Kelly's 1911 *Directory of Sussex* has an advertisement on page 43 for the Crowborough Brick Company, 'adjoining Crowborough & Jarvis Brook Station.
The Crowborough Brick Co. Ltd advertised 'Crowborough multi-coloured best kiln stockbricks - medium range' and 'Crowborough hand pressed bricks' at the South Eastern Brick and Tile Federation's display at the Building Exhibition at Olympia in 1953.

The closure of the works and cessation of production in February 1980 was noticed by W.R. Beswick and Molly Beswick in an article 'Closure of Crowborough brickworks' in the *Newsletter of the Sussex Industrial Archaeology Society* 26, page 6 (1980).

According to John de Haviland the Crowborough brickworks were worked from c. 1870 to 1980 [*Great Bush Telegraph* 4, 1 - 17 (1982.)] The railway here was opened on 3 August 1868, the station being at first known as Rotherfield, a settlement actually two or three kilometres to the east, which later acquired a line and station (now closed) of its own. Crowborough on the other hand is getting on for two kilometres west of the station, at the top of an exceptionally long hill.

Tunnels and shafts at Beddington (London Borough of Sutton)

There are known to be several tunnels and at least one vertical shaft in the Thanet Sand of Beddington, to the west of Plough Lane (B272) and the south of Croydon Road (A232.) So a telephone call from the new owner of a Victorian property in this area requesting advice, information, and investigation of voids below two stone slabs and an iron manhole cover had to be followed-up.

The property in Sandhill (dated 1862 on the front) was the lodge to a now-demolished house, much of the land of which has now been taken for widening the Croydon to Sutton Road on its south side.

This site is on a north-south ridge of Thanet Sand (overlying chalk) which runs southwards from near Beddington's parish church (St. Mary's) via Bandon Cemetery to the Croydon to Sutton railway line.

Tunnelling is known within this ridge at at least two, and possibly three places. The 'Beddington Caves' (the entrance to which is now firmly bricked up) were excavated into the Plough Lane roadside bank opposite The Plough public house, and used from time to time by the proprietor of that establishment as a cellar.

Less well-known 'caves' were described in 1949. Exploration by Sidney L. Birchby (reported by G.A. Peet) was reported as follows:

> About 1940 Sidney Birchby spent some time investigating the alleged presence of caves and underground passages at Beddington. Later he was joined by other Group members; including myself. We made exhaustive enquiries and searched diligently but located only one old heading about 20 ft. up the face of a disused sandpit opposite Queen Elizabeth's Walk. This went in for a short distance to where a draw well about 20 ft. deep gave access to a drive about 60 ft. long. We also discovered that a man-hole cover in Queen Elizabeth's Walk covered not a sewer but what appeared to be an underground passage in the sands. Permission to enter was not at that time

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> sought but it might be worth approaching the Town Clerk for the necessary sanction.

The heading and well had in fact already been reported in print in 1909, and in more detail in 1915.

Sand pits, worked for sand for the manufacture of white sand-lime bricks, had been established on the north side of the Croydon – Sutton Road, to the east of Guy Road at Beddington. Jesse Clack [1857 – 1910] had come to the Croydon area from Oxfordshire aged 23 and lived and worked in Croydon for 10 years [c. 1880 – 1890] managing a brewery before moving to Beddington and commencing business as a contractor in or about 1896. About five years later (c. 1904) he began the manufacture of 'Beddington white bricks' a concern continued after his death by his son David Clack until the works closed in or about 1929.

On 16th May 1914 Christopher Charles Fagg (1915), jointly with David Clack, had conducted a visit by some 30 members of the Croydon Natural History and Scientific Society to Beddington, including a tour of the brickworks. After an explanation of the brickmaking process, the report of this visit continues as follows:

> Another interesting item seen at the brickworks was a very old well. To examine it the party had to go through a tunnel cut out of the sand for a distance of about eighty feet. The peculiarity of this well is that it is lined with pieces of chalk cut into blocks and laid with a fair degree of regularity. From the surface it is over seventy feet deep, but the party inspected it from about fifty feet below the surface. When discovered some years ago, the well was filled up, and a large quantity of bones, chiefly of the Wolf, Dog and similar animals were raised. The firm emptied this well to provide drainage for the brickworks, which lie below the level of the ordinary drainage system. Some authorities place the age of this well at as early a time as the Roman occupation of Britain.
>
> After leaving the brickworks the party proceeded to explore the caves in the Thanet Sand at the corner of Plough Lane. Many theories have been put forward to explain the origin of these caves, the most generally accepted among archaeologists being the unromantic one that they are medieval quarries.

The well was further described by G.W. Moore (1910), the Society's secretary, as follows:

> Though the find at Beddington Brickworks, of which Mr. Jesse Clack sent me notice at the beginning of December last year (1908), does not promise to be of surpassing interest from an antiquarian point of view, I thought it better that we should have some record of it, and therefore prepared a short note.
>
> Some years since - Mr. Clack cannot say exactly how long - he had occasion to clear away the upper portion of the soil and sand (Thanet) to a depth of about eight feet, and came upon what appeared to be the circular head of a well, situated at the south-east corner of his works. He has been unable to trace any records or knowledge of its existence. In order to preserve the head Mr. Clack had two layers of bricks placed round it, but did not then continue working. Subsequently, a year or two since, he made some further investigation, but was compelled to relinquish it, and it was only last November that any serious attempt at investigation was made and actual excavation carried out. The result was that a circular shaft was found, 3 ft. 9 in. wide, lined with courses of chalk, cut with fair regularity into chalk-sets, and laid very evenly but un-cemented. At a depth of about fifteen feet a cavity was found, but further down the shaft was again filled up. The clearing out was continued to a depth of forty-eight feet, to the base of the Thanet Sands, and here the width of the shaft increased to 4 ft. 6 in., still lined with chalk, but below this the walls rested upon the chalk underlying the sands; and the shaft opened out into a chamber, which was filled up with earth and bones to a further depth of possibly twenty feet. The total depth from which remains have been brought up is sixty-two feet. The bones turned out consist of horse, ox, goat or horned sheep, pigs, dogs (various kinds, large and small), cat, and two skulls of deer, one probably a fallow-deer, and the other larger, with portions of antler attached. A few fragments of tiles (very rough), a small portion of a pot with a handle, and a glass fragment, apparently of an ornamental nature, very iridescent, and a piece of iron that may have been an ox-shoe were also found.
>
> The glass and the handled fragment of pottery are now at the British Museum for examination. The condition of the bones varies. Some may have been buried for

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some three or four hundred years, but others are in better condition. The teeth are in most cases in good preservation, and in some firmly fixed in the jaws. With one exception none of the bones appear to have been cut or sawn, nor are there any marks of gnawing so far as can be traced.

After clearing out the shaft Mr. Clack had a gallery run through the sand to the shaft at a depth of about twenty-five feet, and lower down a second gallery, from which he was able to trace the sides of the pit which had been dug. These slope outwardly towards the surface, and it would appear that subsequent to making the pit a shaft was built up and the earth thrown in around it. At the galleries the demarcation of the undisturbed Thanet Sands and the earth that has been thrown in is very clear, and the natural sand is more cohesive than the other portions.

Various suggestions regarding the shaft and contents have been made, but it is probable that it was in some way connected with old Carew House, now the Beddington Orphanage. Possibly a well was made, and afterwards used as a refuse place. Mr. Clack is continuing work with the intention of supplementing the water supply for his works, as water exists at the base, and enters freely at the sides towards the bottom of the shaft. Mr. Reid, of the British Museum, considered the glass fragment to be a portion of a vase, probably Italian fifteenth century.

From all the evidence available, it appears that Jesse Clack's sand-pits extended to the south side of the Croydon to Sutton Road, and the well 'in the south-east corner' of his land was on the south side of the road – an area now largely lost to road widening, perhaps at or close to the 1862 house.

Your reporter, having done his preliminary desk-study, had come prepared with caving lamp, helmet, wire ladder, and all necessary kit, hoping to spend the afternoon in a nice dry shaft and sand tunnel. Disappointingly, the two manhole covers (one old flagstone one, the other a modern iron one) being duly lifted, revealed only two cisterns, one full of builders' rubble, the other containing a depth of at least eight feet of slighlty smelly water.

It seems likely that Clack's well shaft top is probably lost as a result of the road widening, although the horizontal tunnel from his sandpit (the pit is now landfilled) to the well may still survive at a considerable distance below the road, albeit blocked at its outer end.

This leaves the man-hole cover in Queen Elizabeth's Walk, noted by Birchby and Peet, said to have covered not a sewer but what appeared to be an underground passage in the sands. An examination of man-hole covers in Queen Elizabeth's walk in 2006 revealed all those visible (some were under parked cars) to be of one standard design. Your reporter thought that the neighbours might have taken a dim view of his lifting every cover in the road, so deferred further investigation to another time!

Source: C.C. FAGG, 1915, Excursion to Beddington. *Proc. Croydon Natural History and Scientific Society* 8(1), x – xi.

Source: G.W. Moore, 1910, The recent excavation of a shaft at Beddington Brickworks. *Proc. Croydon Natural History and Scientific Society* 7(1), xix - xx.

Source: Geoffrey A. PEET, 1949, Caves at Beddington, Surrey. *Proc. London Speleological Group* 1, 3 – 4.

NEWS – TUNNELS AND TUNNELLING

Docklands Light Railway extension to Woolwich: tunnelling progress under the Thames

The extension of the docklands Light Railway from King George V Dock station to Woolwich Arsenal Station will include two new under-river single track tunnels, with an additional platform alongside but lower than the existing down platform at Woolwich. The additional 2.5 km of line will include 1,780 metres in the upstream tunnel, and 1,830 metres in the downstream one. There will be two under-river cross-passages linking the tunnels, for operational, inspection and maintenance purposes. There will, possibly, also be an additional intermediate station on the south bank of the river, provisionally called Thames Wharf Station. A shaft for this is currently being sunk, of 15 metres diameter, and 40 metres deep. An over-run tunnel of 110m will be provided at Woolwich. Woolwich to Bank trains are expected, at peak times, to depart at four minute intervals.

At present the western tunnel is being driven southwards from the north bank using a 540 tonne earth pressure balance (EPB) tunnel boring machine (TBM). The prevailing waterlogged ground pressure at the working face (in places 35m below the river bed) of 50 psi is balanced by the excavated material being retained in a chamber immediately behind the cutters, from which it is withdrawn and conveyed to the rear of the TBM for removal from the works by a

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light railway. The tunnel is being bored through a challenging variety of ground materials, including water-bearing alluvium, gravels, sand, and flinty fissured chalk. Excavated material is taken by barge to Tilbury and sent to landfill.

Although the central parts of both tunnels will be bored, sections at each end will be of 'cut-and-cover' construction and covered ways.

Concrete tunnel lining segments are manufactured on site on the north bank. When the upstream tunnel is completed, the TBM will be lifted at Woolwich, conveyed back to the north bank via the Blackwall tunnel, and set to work again on the downstream tunnel. It is expected that the TBM will then be available for further tunnelling elsewhere, on completion of the under-river tunnelling in June 2007.

Source: John SULLY, 2006, Woolwich extension progress. *Modern Railways* 63(697), 16 – 17.

Thousands trapped in London tube train tunnels after signals fail

Eight tube trains carrying thousands of passengers were stranded following two signal failures in September 2006. Six of the trains came to a halt in the Northern Line tunnels as a result of two signalling faults at Morden. The first failure resulted in three trains stuck between Tooting Broadway and Morden from 20.00 to 21.30. A recurrence an hour later the same evening halted three more trains, which were not able to move until 23.05.

On the Bakerloo Line, two trains were halted for about half an hour between stations during the rush hour following a signalling failure between Queen's Park and Paddington. The trains were moved to Kilburn Park and Queen's Park stations to allow passengers off.

Source: Dick MURRAY and Jack LEFLEY, 2006, Thousands stuck in Tubes after signals fail. *Evening Standard*, 14 September 2006, page 6.

Duke of Portland's tunnels at Welbeck Abbey, Nottinghamshire

The 5th Duke of Portland (William John Cavendish Scott Bentinck [1800 - 1879]) is known, amongst other things, for his secretive nature, and especially for the construction of a number of cut-and-cover tunnels and rooms linking Welbeck Abbey (now an Army 6th form college) with the nearest railway station, enabling him to get to and from his property in London unobserved. Brian Slater, following-up the railway interest, arranged a visit (21st September 2006.) The following notice appeared in the Railway and Canal Historical Society's *Bulletin* ..

> North East group – Thursday 21st September. Welbeck Estate Tunnels: walk from Creswell to Worksop, 7 miles, packed lunch; leader Brian Slater. Not railway or canal, but road tunnels. In the 1860s, the very rich and eccentric 5th Duke of Portland built several miles of cut-and-cover tunnels through his estate so that when he wished to drive out of the estate in his carriage, e.g. to Worksop Railway Station, he would not have to set eyes upon any of his servants, a situation which could have led to instant dismissal of the staff concerned. They are still there in a ruinous condition, and parts of them will be inspected as much as practicable. ...
>
> The walk will include passing Creswell Crags and caves, with their Neolithic wall paintings, not, however, accessible to the public.

And ...

> Portland Duke's underground secrets
>
> The 5th Duke of Portland may have had strange habits .. constructing tunnels beneath his park so he could sneak away to the railway station unseen, but one eccentricity should warrant approval from a railway and canal historical society. Close to the sunken area comprising a semi-circle of underground store rooms at the back of Welbeck Abbey, his former hideaway home but now an Army training college, whence starts one of his road carriage tunnels, an observer may espy a set of narrow-gauge rails. These entered the kitchen quarters of the Abbey and then wound their way along corridors, eventually to the former dining hall. Food, even in large banquet-sized quantities, could have been readily transferred from the underground stores to the kitchens, cooked and shunted rapidly along the passages while still hot. Presumably working on the basis that servants should be heard but not seen, the Duke's meals would thus have been punctuated by the rumble along the rails of the trolley bearing the next course. As the line appears to have been single track with numerous blind corners but without passing loops, one has also to suppose a code of bell or whistle signals to prevent the ingoing jelly course coming into violent

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collision with the outcoming meat-and-gravy empties.

Source: [Brian SLATER], 2006, Portland Duke's underground secrets. *Bull. Railway and Canal Historical Society* 403, pages 2 and 11.

More information on the Welbeck tunnels can be found as follows:

ADLAM, Derek, 2003, Folly or Epitome? The fifth Duke of Portland at Welbeck. *Follies* 15(1)(56), 4 – 5.

ANON, 1895, English homes. No. XXXVIII. Welbeck Abbey. *Illustrated London News*, 3 August 1895, 142 - 147.

DEAL, Susan, 2004, Welbeck Abbey, and eccentric Duke and an exhumation. *Newsl. Victorian Society South Yorkshire Group*, October 2004, 7 – 8.

EDWARDES, Charles, 1892, *Welbeck Abbey*. IN: ANON, 1892, *Historic houses of the United Kingdom. Descriptive, historical, pictorial.* London: Cassell and Company, Limited, fp and pages 1 - 15 [Includes an illustration of one of the tunnel mouths, and a plan of the house at basement level showing the tunnels]

JONES, Barbara, 1979, Some medieval and eighteenth century curiosities and utilities. IN: Harriet CRAWFORD (edr), *Subterranean Britain: aspects of underground archaeology*, 173 – 196.

KELLERMAN, Susan, 1999, Welbeck Abbey. *Follies* 11(2), page 19.

McEWAN, Graham J., 1994, *Crypts, caves and catacombes: subterranea of Derbyshire and Nottinghamshire*. Sigma Leisure: vi + 146 + (iv) pp [Welbeck Abbey tunnels are described in pp. 137 - 140]

WHITWORTH, Damian, 2003, The odd lord of the underworld. *The Times Review*, 1 November 2003, 26 - 27 [Feature article on William John Cavendish Bentinck-Scott, 5th Duke of Portland [1800 - 1879], and his tunnels and underground rooms at Welbeck Abbey, Nottinghamshire]

Greenwich foot tunnel development proposals

Barry Mason, coordinator of Southwark Cyclists, has sent out a message to cyclists in Greenwich, Southwark, and Tower Hamlets concerning the Greenwich foot tunnel. He had previously instigated the celebration of the centenary of the tunnel in 2002. His suggestions are as follows:

Local authorities can do things brilliantly but look at the state of the tunnel and despair. The no spitting etc. signs at the start say it all. Mess.

I keep coming back to my fantasy that a local group takes over the Foot Tunnel from Greenwich Council and its quaint dead hand of municipalisation.

We turn it into an integral part of the Greenwich World Heritage Site experience. Tourists are encouraged to walk the tunnel for an entrance fee that works from 10 – 5 every day. Commuters get free passes and only need use them during charging times. The tunnel gets smartened up .. and users get told much more about it. Why is there that extra reinforcing steel-work at the northern end? 1944 bomb damage. With maybe 200,000 tourists a year using the tunnel at £3 each it might be possible to run the operation at a modest profit .. with maybe capital works underwritten by Tower Hamlets and Greenwich Councils. Phase 2 is a new visitor centre at Island Gardens with much better café, loos, cycle hire and the gateway to the Isle of Dogs. Tower Hamlets says it wants more tourists but currently does nothing to lure them north, or south from Canary Wharf City.

With a bit more sense, lift maintenance etc. would be done overnight. Not during the day for the whole of June.

At present the foot tunnel might be just about the UK's most subsidised cycling route. It doesn't have to be like passing through the Greenwich cloaca .. it could be restored to white tiled glowing brass pristine shineyness with a bit of thought and love. The tunnel should be listed by English Heritage. It's a wonderful thing whose neglect is a sin. Those domes over need to be opened to visitors too.

I'm copying this to Sustrans Flagship pre 2012 project.

If anybody's serious about this take-over possibility then let's talk direct .. but I'm not interested in endless wittering .. simply effective dialogue to get the tunnel into safer hands.

A couple of years ago a few of us got the original engineers, Binnie and Partners, to

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help celebrate the 100th birthday. Neither Council were bit interested until the event was organised. Then Mayors limo'd up in droves for the champagne. 20 of us sang 'Happy Birthday to you' while stradding [sic] TH / Greenwich white line border under the waves. Puzzled tourists.

And think about a quick ferry across while we're at it.

And if that horrible bridge downstream in Thamesmead goes in, the Woolwich Ferry will soon close. And that's very sad .. but think about the Woolwich Tunnel too.

And if you're one of those idiots who cycle through it at speed brushing pedestrians on the way, shame on you, stupid.

Source: MASON, Barry, 2006, Greenwich foot tunnel. *Greater London Industrial Archaeology Society Newsletter* 225, 5 – 6.

Trial train running commences in the Lötschberg Base Tunnel, Switzerland

The first electric test-runs in the Lötschberg Base Tunnel took place in the night of 6 – 7 June 2006. A 10-km section of the tunnel has been authorised for test running by the BAV (Bundesamt für Verkehr), at speeds of up to 120 km/h. It was expected that there would in fact be a limit to 80 km/h until August. From October speeds of more than 200 km/h are planned, and by December the entire length of the tunnel should be available. Testing will last until June of next year when the tunnel is due to be formally handed over to the future operator BLS AG. The test running is primarily concerned with establishing the safe functionality of the ETCS Level 2 equipment, and in particular, that balises, locomotives, and control centre are all communicating faultlessly with one another.

Source: ANON, 2006, Switzerland: operating tests begin in Lötschberg base tunnel. *Modern Railways* 63(696), page 62.

NEWS – CONSERVATION, HERITAGE AND PLANNING

World Heritage Site status for Cornwall and Devon mining landscapes

The UNESCO World Heritage Committee, meeting at Vilnius (Lithuania) in July 2006, has accorded selected mining landscapes in Cornwall and west Devon World Heritage Site status. The 10 sites collectively cover 19,600 hectares of land at former mining sites operated between 1700 and 1914. They are the St. Just mining district; the mines-related port of Hayle; the Tregonning and Gwinnear mining districts with Trewavas; the Wendron mining district; the Camborne and Redruth mining district with Wheal Peevor and Portreath Harbour; the Gwennap mining district with Devoran, Perran and Kennall Vale; the St. Agnes mining district; Luxulyan Valley and Charlestown; the Caradon mining district; and the Tamar Valley mining district with Tavistock. The Cornish and Devon mines were worked for copper and tin, and to a much smaller extent for other metals such as arsenic, tungsten and uranium.

Included within these areas are mine-shafts, engine-houses and engines, processing works, transportation infrastructure, miners' housing and associated buildings, and related ports and harbours.

Source: Ainsley COCKS and Deborah BODEN, 2006, World Heritage Site status for south west mining landscapes. *Links [Bulletin of the Newcomen Society]* 199, page 4.

South Kensington Subway Listed as of Architectural or Historical Interest

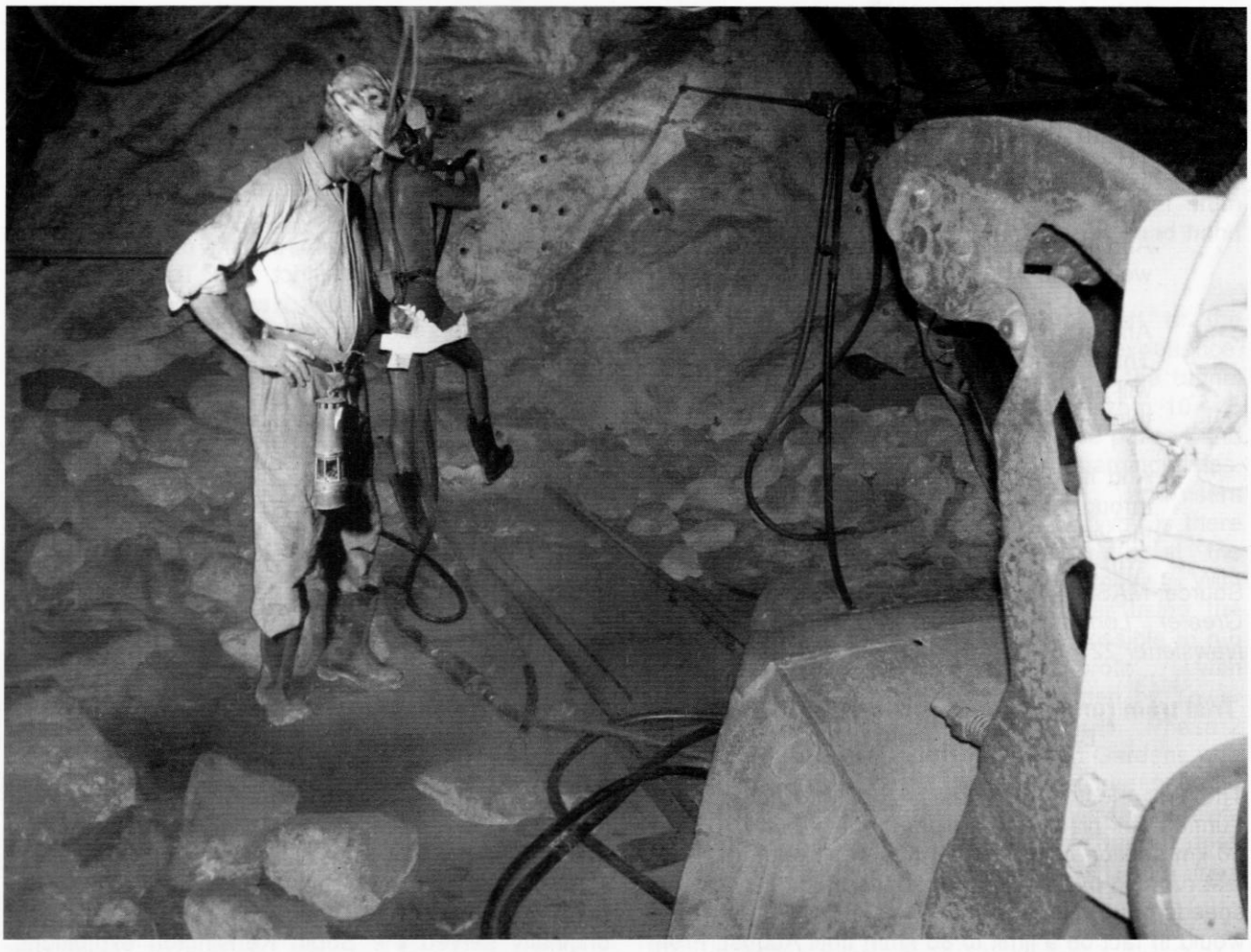
The 433-metre subway which provides a convenient pedestrian link between South Kensington Station and the nearby museums has been granted Grade II listed status. The subway, built by the Metropolitan District Railway and opened on 4th May 1885, originally served the South Kensington exhibitions, but when the last of these ended in 1886 it fell into semi-disuse. Illuminated by electricity from the outset, it was occasionally pressed into service when needed, but not officially re-opened until 1908, when it was made available for free public use.

Source: ANON, 2006, Subway achieves listed status. *London Railway Record* 49 (October 2006), page 140.

[Supplementary note: the cut-and-cover subway commences on the north side of the ticket hall of the underground station, and passes by way of two right-angled turns below Thurlow Street and Exhibition Road. It has an exit part-way along to the gardens fronting the Natural History Museum on the north side of Cromwell Road, and access to the Victoria and Albert Museum a little further up Exhibition Toad on the east side. The subway terminates on the west side of Exhibition Road near the former post office building, just short of Imperial College Road. Although, as a 'hole in the ground' it could not be Listed, it qualifies as a 'building' for listing on the grounds that the floor, side walls, and roof are 'built.']

News Etc From Paul Sowan

The Couriot Coal Mining Museum at St Etienne, France



Reconstructed coalface and drilling machine

Many in Sub Brit will be aware of the extensive coalfields in Northern France. We have visited the Lewarde Museum near Douai on one of our French trips and the remaining spoil heaps form a prominent part of the landscape overlooked by Vimy Ridge. Less well known is the once substantial coalmining that took place in the Loire Basin around St Etienne, about 60 miles south west of Lyons. We visited the Couriot Coal Mining Museum after attending the 2006 SFES (French underground group) annual field trip in nearby St Just St Rambert.

The site was first developed with the sinking of shafts in 1850 and 1870 but the museum is based around the third shaft, sunk from 1907 onwards. The site was named 'Couriot' after the then Chairman of the company. The shaft eventually descended 727 metres (just under 2,400 feet). At its peak, the mine employed over 1,000 miners and produced upwards of 3,000 tonnes of coal per day. The mine finally closed in 1973 but it has been preserved as a fitting memorial to those who toiled there.

The entrance to the museum opens out into a central courtyard, surrounded by administrative and machine rooms. Prominent in the centre of the courtyard is a large monument erected in 1920, which honours both those who fought in the First World War and those who died as miners. The unusual joint memorial has a sculpted soldier and miner either side of a bronze angel. The miner is equipped with a hammer and chisel – literally constructing his own epitaph. An excellent audio-visual presentation (in French) is given in the original (c. 1913) pit head baths, giving a first rate summary of the site's history, using lots of archive film. Towering above the whole are the now vegetation covered immense twin spoil heaps – locally known as the Mamelles (Breasts) of St Etienne!

The main tour takes in the later (1948) baths and changing room which are both huge. Each miner hoisted his work clothes to dry suspended from the ceiling between shifts which gave rise to its nickname 'Salles des Pendus' (the hall of the hanged men). Exactly the same approach was taken to the changing rooms on the French side during the construction of the Channel Tunnel. The lamp-room

The Couriot Coal Mining Museum at St Etienne, France

The sad eyes of miners descending in 1973 to cut and abandon the cage at the 727 metre level.

is similarly impressive with lots of original lamps and tallies still in place. The tour next visits the large machine hall which has equipment in situ including a winding engine, air compressor and ventilation plant. If and when funds allow, the plan is to return some of the machinery to working condition.

The descent into the underground galleries is when the fun begins! Although issued with hard hats, there was surprisingly no mention of ensuring that matches and lighters ('contraband') were left on the surface. The descent from the original pithead takes about thirty seconds with the shaft wall speeding by and a substantial updraft.

The underground tour commences with a short ride on a locomotive hauled wagon and the explanation that the trip will take visitors back through mining history and time. Continuing on foot you pass a coalface with fully automated hydraulic supports and extraction. This is followed by pneumatic drills and finally by hammer and picks with videos showing the tools in action. Photographs and exhibits also show how other technologies such as lighting and transportation have changed over the decades in the local coalfield.

Before the return journey, the tour passes reconstructed underground stables. The mine used quite sizeable horses which were too large to fit in the cage. Instead they were suspended sideways on chains beneath the cage for their descent. Unlike English pit ponies which generally returned to the surface for the annual holiday fortnight, the French journey was strictly one-way. My own Grandfather looked after pit ponies underground in the Barnsley coalfield in the 1930s – maybe one of the reasons behind my fascination with things underground.

After the ascent to the surface, careful examination showed why there were no notices listing objects not allowed underground. The museum galleries are in fact cut and cover just feet below the surface in the old coal yard. The descent is achieved by a continuous roll of simulated shaft passing at great speed with large fans providing the airflow. Cheating on one level (pun intended) but very realistic and a way to ensure visitors at least get an underground experience without the costs of maintenance and pumping. The guides don't let on the truth and the vast majority of visitors don't realise they've been duped!

A well stocked book and souvenir shop concludes the visit. The immediate area used to have lots of associated plant (coal cleaning and sortation, gas works, company housing etc). Much of this has been lost but there is enough left to get a feel for the size of the industry when it was at its peak.

The Couriot coal-mining museum at St Etienne is open every day apart from Tuesdays and Bank Holidays between 10:00 and 19:00 (closed for lunch between 12:45 and 14:00).

(archive photos from the Museum collection, present day by Martin Dixon)

From Martin Dixon

WWII Sites on the Wirral

Moreton decoy control bunker

Introduction

This article attempts to describe some of the WW2 sites, on, and around the Wirral. The exploration of these remains leads into some overall description of what was actually taking place on the Wirral, in WW2.

Project Initiation

Like all projects, this started in a minor way. This started with a Subbrit local area visit in March 2005, to various sites around the Humber estuary, east of Hull, which was arranged by Charley Hill.

The visit was to his own ROC post, various WW2 bombing decoy sites, control bunkers and the Hull Docks decoy site on Cherry Cob Sands, which was the subject of the recent TV program.

One of the decoy control bunkers was exactly the same as an anonymous brick building on the other side of the field opposite where I live at Little Neston on the Wirral. It is perched on the 'edge' of the estuary bank, fairly well hidden, and on the road to the Decca Navigator Station.

The building was identical, it was a decoy control bunker, but it was down in the Cheshire CC records as a 'W/T station', this is incorrect, but an easy mistake to make as it is at the start of the road leading to the (ex) Decca Navigator station. I understood that the Decca Navigator was a post-war development of the Gee system used by Bomber Command, so the W/T Station designation must be incorrect.

Luftwaffe Bombing Decoys and RAF Bombing Practice Targets

The OS references of the decoy sites are given in the 'Fields of Deception' book by Colin Dobinson, English Heritage. It is obvious that there were a number of decoys down the west coast of the Wirral peninsula. The obvious questions came to light, why only down the west side of the Wirral, and what for?

Some local investigating and exploring followed, undertaken usually at dusk, as most of the sites were in agricultural areas. We did have some nice leeks for dinner though. I doubted two of the locations given, the one out in the middle of the Dee Estuary, and the Puddington group. I know the marsh fairly well, and was bit mystified, as I had not observed anything obvious. The 'Neston at War' book described 'something' on Burton Marsh, a mile long, and supplied with a railway. My first breakthrough was from the Range Warden on the Sealand Army Shooting Range, who directed me to some 'posts' on

WWII Sites on the Wirral

Dee Marsh WW2 RAF Bombing Practice Targets

the marsh, just on the horizon. He said they were the same as those on the TV program, 'you know, just like the docks.'

Some substantial quantities of mud later, they obviously were not the same, but appeared to be some form of target in triangular formations. Another mystery. I met up with Mike Grant, who is a local author, and has several books to his credit, including the 'Wings Across the Border" series, which describes the aviation heritage in Shropshire, N. Wales and the Dee Estuary, one volume of which has sections on the Dee Estuary

About this time, decent aerial photographs started to become more available on the Internet, which led to some detailed study. It is quite difficult, matching photographs, with maps, to what is actually on the ground. It's also important to have a number of sources, giving different views at different times of the year.

We started with the local brick bunker. Mike quickly recognised it as a decoy control bunker, probably for the Burton Marsh decoy. It is in quite good condition, and similar to the buildings on the Humber sites.

Following that was the identification of the Puddington decoy control bunker, which was still there, but built to a different design. The aerial photos showed some ground works, which revealed the location of the actual site of the decoys, but yet again, nothing remained on the ground, probably because the actual decoy structures themselves were very simple, and were probably easily and quickly reused in the local economy.

As the marsh was drying out, we ventured out to the 'poles' on the marsh, which were actually RAF bombing practice targets, Mike knew of their existence, but did not expect to find any remains, or such a number. There was no doubt as to their function, as the conditions were so dry during the summer that the marsh ponds had dried out, revealing hundreds of practice bombs. As the ponds probably covered 2% of the area, there must be thousands of slowly decaying practice bombs out there.

More exciting, was the discovery of big bomb craters out on the marsh. The majority of the ponds are only around a foot deep, but the dry summer had dried out the ponds entirely, revealing some to be in excess of 12 feet deep, located around the Burton Marsh bombing decoy. These were obviously the result of Luftwaffe ordnance – showing that the decoy did actually work.

WWII Sites on the Wirral

RAF Practice bombs near the targets

Other sites on the Wirral were soon identified. Often it is very easy to identify the locality, and generally the grid references were accurate. The other sites around the coast are Puddington, Burton Marsh, Gayton, Heswall, Hilbre Island, West Kirby, Moreton, Wallasey and Brimstage in the middle.

One amusing note is that the West Kirby decoy was a matter of yards away from what was a RAF recuperation camp - some recuperation. Another is that the Wallasey one is almost yards from Bidston station, at the junction of the Wrexham-Bidston, Liverpool-West Kirby and Liverpool-New Brighton railway lines. Obviously we must have expected the Luftwaffe to bomb them accurately.

The Hilbre Island site appears to have had a reputation for efficiency, a Luftwaffe report mentioned that 'the sea appeared to be on fire', after a firing had gone wrong on one occasion.

There are several 'features', which appear to be common:

- Trackways around the site to the actual decoy installation.
- A substantial supply road, as the decoys consumed several tons of material for each firing
- Good visibility of the Dee Estuary
- A well hidden control building usually within 100-400 yards from the actual decoy site.
- They are often near a golf course (!)
- The site is often still unused for either agriculture or grazing
- A lack of physical remains

Usually located in fields or marshland.

There is a remaining control bunker at Moreton, it was spotted by my wife, and is only yards from a road. It is of the usual design, but semi-buried. It's quite intact, but with the curious feature of having useless gutters and drainpipes on a semi-buried building.

We had an outstanding visit to the Burton Marsh decoy, which is a matter of a hundred yards from my house. This was supplied with a railway. From the aerial photographs again, it is fairly easy to spot the railway route, and is also easily identifiable on the ground. It ran on a small embankment, which was another clue, the embankment leading to the bottom of Marshlands Road, which was the site of the DenHall Colliery spoil tips – which was obviously a good source of material for the embankment itself.
The visit was on a very wet rainy day, during the autumn high tides. This was not a good idea. We got wet, seriously wet. What was obvious however, was the scale of the site. The 'Neston at War' book said that it was a mile long, which was not too far wrong. We only ventured out onto the edge of it from the northern end, which was cut short by the tide coming in. It requires further exploration, at a better time of year, however our short trip did reveal quite an extensive network of embankments, and a direct path leading back to the control building.

Nightime Aerial Activity on the Dee Estuary

The overall intention of the bombing decoys was to convince the Luftwaffe pilots that they were not where they thought they were, and to convince them that the decoys were indeed a city or factory burning, and that this is where they should drop their bombs.

The decoys were a collection of steel baskets containing tar, oil, rags, timber and anything that would burn; they were electrically ignited and controlled from a local small bunker. The operation, locations and design were very closely guarded secrets.

With help from Mike, we pieced together some idea of the WW2 defences and activity on the Wirral. The overall aim was to defend Liverpool, which was the main port for Atlantic convoy traffic from the USA.

Without really thinking, it would be expected that the Luftwaffe who were attacking Liverpool, would have come across the Pennines, from Germany. Not so, they came from the south, crossing over the south coast, then the Severn Estuary, picking up the mid-Wales railway, which was known as "Adolf Hitler's Railway". It was a fairly easy matter to pick up the tracks in the moonlight, and then follow them up to the south end of the Dee Estuary, along the Dee Estuary, and finally turning right to pass over to Liverpool.

The route was however over the Vickers aircraft

WWII Sites on the Wirral

factory at Chester; RAF Sealand; and Shotton Steelworks, so these sites had their own Anti Aircraft guns defending, and their own decoys. RAF Sealand had its own airfield decoy on the 'Inner Dee Marsh' near Puddington.

The decoys started well south of the Dee Estuary, with a sites near Wrexham, on Minera Mountain, and another on Llandegla Moors. One of my own relations used to drive the supplies up to the decoy site on Minera mountain. There was also a separate decoy for the Rhydymywn works at Cilcain. Once they had passed over Chester and Shotton, the intention was to convince the Luftwaffe pilots that the east coast of the Dee Estuary (Wirral Peninsula) was the east coast of the Mersey Estuary, hence the pattern of sites, both up the coast, along the north coast, and additionally one in the in the middle of the Wirral. There were no sites on the east coast of the Wirral.

If not fooled by the decoys, there were then lines of AA guns, usually manned by Home Guard crews, guided by Army ground radar at Puddington and Raby, both near Neston, and also Leasowe on the north coast. There were also 2 batteries of AA rockets, in higher Bebington, and New Brighton, but I believe that these were never used in anger. The aim of the AA guns was obviously to shoot down the attacking aircraft, but the real benefit was to drive the bombers higher, which made their bombing more inaccurate. There were also the Maunsell gun platforms in the Mersey Estuary, off Formby.

Daytime Aerial Activity on the Dee Estuary

It is quite easy to imagine that the aerial activity on the Dee Estuary was limited to overnight bombing raids directed at Liverpool. This was far from the truth, in fact this area did see lots of activity, such as is described below.

- There were bombers practising on the Dee Marsh bombing practise range, using the set of targets described earlier.
- There were aircraft practising on the gunnery range at Talacre.
- The radars on the N. Wales coast were constantly receiving upgrades, and repairs, necessitating aircraft flying on special radar calibration flights in Liverpool Bay.
- Aircraft that were being repaired at RAF Sealand required testing, one of these, a Mosquito, crashed near the railway bridge adjacent to where I live.

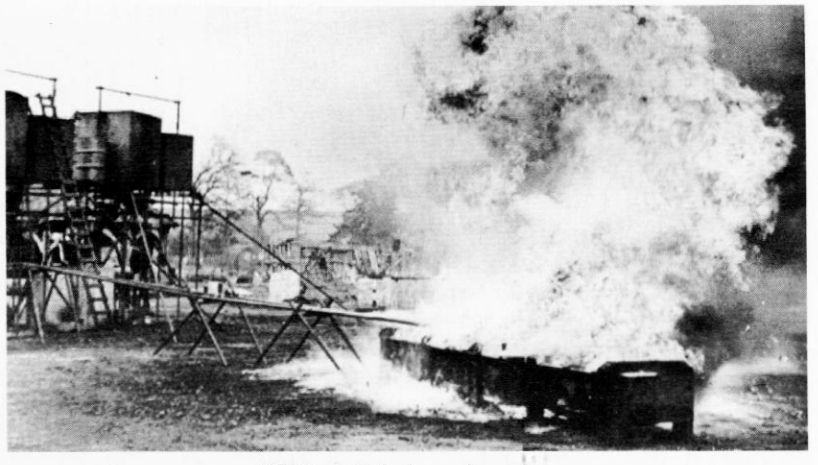
There were ferry flights of aircraft arriving from the USA, being delivered to either Speke, Hooton or RAF Sealand.

Birkenhead Defences

I admit to being puzzled by the number of pillbox remains, that are still around on the Wirral. Allowing for some destruction, there are still a significant number remaining. Surely, the war would be pretty well over if the Germans reached the Wirral.

Another puzzling find is that in one of my lunchtime explorations of old Speke Airport, I found some pillboxes on the southern edge of the airfield, but these had the gun slits pointing in, towards the airfield.

The recent book "Beaches, Fields, Streets and Hills"



WW2 starfish decoy in action

from English Heritage answers these questions. Apparently there was a genuine fear of a limited German invasion of the Wirral and Merseyside, with airborne forces landing at Speke airport, and also Hooton airfield on the Wirral, with the Hooton forces advancing up the A41 towards Birkenhead, with the intent to occupy, and cut off the Wirral, to disrupt the convoy supplies coming in to the Mersey.

The pillboxes were obviously parts of the Birkenhead "Stop" lines, as part of the defences. There are also a number around the Lever Estate, apparently the miles of Poplar tree lined roads around Lord Levers estate were used to hide vehicles being stored for D-Day.

And the explorations continue, there is still lots to see. In particular the extents of the Burton Marsh decoy and control bunkers for decoys to be found.

From Phil Pritchard

Greys Court Ice House

Introduction

We visited the National Trust property, Greys Court, in August 2006. The property is near Henley, in Oxfordshire, and is currently undergoing restoration work on its roof. It's a small country house, with a history going back to 1347, from which time a tower still remains – you can climb this to get some fantastic views over the extensive gardens – also open to the public. Beyond an intact Ha-Ha is an Ice House, which we naturally visited.

So what is an Ice House ?

For a comprehensive description on Ice Houses and a Gazetteer of all such buildings in the UK, I highly recommend the book co-written by Sub Brit's founder member, Sylvia Beamon '*The Ice Houses of Britain', Sylvia P. Beamon and Susan Roaf, pub. Routledge 1990. ISBN 0-415-03301-2.* Since almost all Ice Houses have an underground element, they are often referred to as Ice Wells.

So, here is a short overview! Before the introduction of refrigerators, almost every large country house in Britain had an Ice House; their history can be dated back to the seventeenth century. The aim was to keep supplies of ice cool and available throughout the warmer months - – providing ice for drinks, sherbets and ice-creams; the ice was also used to keep meat and other food stuffs fresh.

There are many styles and forms of Ice Houses, but generally speaking each is a small, brick built, underground structure, located in the gardens or grounds of the big house. They are usually covered in a mound of earth, planted with trees to provide shade. The shape tends to be in the form of a steep sided bucket comprising the underground part, covered by a dome. Access is at the top, usually on the North (shady) side and ladders would have been used to store and access the ice.

In winter, ice would be collected from a nearby lake or pond (which most country houses had), being harvested when it was thick enough and then brought to the ice house. The ice would be packed in the underground chamber, possibly interspersed with straw (for insulation) and it would then keep all the way through the heat of summer. Later, ice was

Greys Court Ice House

imported from Canada and Scandinavia – this also being the source for early domestic refrigerators.

Greys Court Ice House

The Ice House has been constructed away from the main house, and is accessed by crossing over the Ha-Ha and following a path through the fields. The spot would have been chosen to be as shady as possible (thus keeping the ice cool), and to be relatively close to a source of ice.

It's been recently restored and reconstructed, since in Sylvia's gazetteer she recorded that it was roofless, and indeed the information board, provided by the National Trust, states that it was derelict and collapsing in 1991. The reconstruction is based on the evidence of material found on site. The subterranean chamber has been reconstructed in brick, with some flint included in the dome cover. The whole lot has had a timber and thatch roof over, to increase insulation from the sun, supported on a flint wall.

The access door faces NNE and is protected by a short entrance passage, which would have provided further insulation to the main chamber. The door is left open currently, so you can walk through and look down in to the depths of the underground chamber, this is some 5 metres deep. There is a drain at the bottom, to allow egress of any melt water from the ice. It's certainly nice to be able to get access and look into an Ice House, since many are tumbling down and locked up. The National Trust also thoughtfully provided a torch to look down.

There is evidence that trees were originally planted around the ice-house to provide further shade, and the remains (as the trees are no longer there) have been analysed and suggest planting dates of 1810 and 1817, thus believed to be contemporary with the building of the ice house. The bricks are presumed to be late 18th / early 19th century, and the reconstruction uses the thoughts of William Cobbet who was publishing plans of thatched rustic ice-houses at that time.

The ice is thought to have been sourced from an ice-pond, in a small depression to the south-east of the ice-house. This is now occupied by a stand of fir trees, but in reality looks a bit too small to me. An alternative (or additional source) may have been the lake associated with the Ha-Ha running round the formal grounds of the house.

Summary

All in all, this is a very nice example of an Ice House, and shows the ingenuity of our ancestors, and the lengths they would go to to make sure they had some ice for their gin and tonic on a summer evening. Even though the main structure has been heavily restored, and to a large extent is a reconstruction based on the material found on site and using examples from published works, it is well worth a look if you are in the area.

Photos and Text From Linda Bartlett

Study Weekend 2006

The Subterranea Britannica Study Weekend at Bristol, Friday 7th to Sunday 9th July 2006

This year's Study Weekend was based at the University of Bristol's Hiatt Baker Hall of residence on the northwestern outskirts of the city, shared with a large group of Italian school-children and students whose celebration of their homeland's victory in the World Cup enlivened the Sunday evening. We also enjoyed the sound of distant fireworks, part of the Brunel bicentenary celebrations. The residential blocks were clean and decent, although the push-button locks baffled two long-standing members, including the Chairman! Catering was rather school-dinners style, but adequate. About 45 members attended.

Linda Bartlett and Martin Dixon, with their characteristic flair and efficiency, had arranged a splendid and well-balanced programme, incorporating amongst other things mine and quarry sites, a funicular railway tunnel with World War II secondary uses, and a Cold War bunker. As usual, all participants received a folder full of relevant site details.

Limpley Stoke: Hayes Wood underground building-stone quarry

The highlight, for this writer, was a visit to a working underground stone quarry at Limpley Stoke. Here the immensely enthusiastic mine manager had given up his Saturday morning especially to shew SB members around. We hope he will be signing up as a member! An invitation was extended to return for a more thorough visit at some time in the future, to see work in full swing. The Mines Inspector had dictated a maximum visiting party size of 15 persons, so we had to go down in three separate groups. As there is working machinery underground, health and safety provisions demand the use of self rescuers by all entering the quarry. Uncontrolled accidental electrically initiated combustion of fuel or other materials could lead to smoke and much- reduced visibility, and dangerously high levels of carbon dioxide and carbon monoxide in a very short time. We were left fully aware of the risk (albeit a very small one), and of exactly what to do in an emergency. This was one of the most intelligently delivered and effective health and safety briefings I have witnessed.

This site, technically in modern legal terms a mine, had been used during World War II for storage. Immediately inside the entrance we saw massive brick support pillars built-in during this period, steel beams to hold the roof up, and so forth. As much of the quarry floor has been removed by secondary quarrying, each of these pillars could be seen to be standing on shorter pillars of unworked stone. We went through the old almost worked-out pillar-and stall workings, passing on the way the large saws used to trim stone blocks to the required shapes and sizes. The quarry is flourishing, with some 70% of its output being sold for new work, the remainder for conservation and repairs. Two distinct but superimposed beds of stone are worked.

This older area of the quarry is bounded on one side by a fault and an accompanying area of unsuitable stone. The company has almost completed a substantial drive through this poor ground, rising some six metres to a further large resource of sound stone beyond it. In this zone the use of rock bolts to support the quarry ceiling was explained to us. Once fully into the new area, the quarrying will be developed into a further pillar-and-stall working using modern stone-cutting (electric saws) and roof-support methods.

Members left Limpley Stoke clutching neatly sawn sample blocks of stone (splendid as paper weights) and glossy brochures from which we can select stone for the Subterranea Britannica Head Office, Library, and Museum, should we ever build one!

We learned that the nearby Westwood Quarry has now ceased stone production, although presumably the archive store continues to function. We visited this site, including the old factory area and inside the archives store, as well as the then-working quarry, on a previous Study Weekend some years ago.

Lunch at the Swan

Such a splendid buffet lunch was laid out for us at the Swan Inn near Box that it deserves a paragraph to itself! As we were to visit the Swan `mine' (a disused underground quarry) in two parties, one group had lunch first, while the other took first turn in the quarry. The first lunch party was quite overwhelmed by the sight of tables groaning under the weight of a quite sumptuous spread! There seemed to be more than enough for both groups. But this, we were told, was all for us. The same again was to be brought out for those that followed! It is usually only in France, where they take lunch seriously, that we are so well fed at the middle of the day. Added to this, there was real ale, and an excellent display of colour photographs of underground quarries of the area on the walls. Another display explained how the pub was prevented form sliding down the hillside here by huge iron chains anchoring it to the rock under or on the far side of the road.

Swan Mine

This, a disused underground quarry opposite the pub, is of great interest in that it contrasts with the usual pillar-and-stall workings seen in most Bath stone

Study Weekend 2006

Crane in Swan Mine - Photo Nick Catford

quarries. A short scramble through a section with limited headroom took us into mainly easy walking-height passages, with prominent cart tracks. The working plan, if that it could be called, was little more than a series of working galleries driven off from the main entrance passageway at various angles, some quite short and others much longer. Some spectacular fallen rock was seen, although no evidence for any recent falls. A very photogenic crane still in-situ attracted much attention from the photographers, as did another such crushed below a large fallen block from the roof. There was also a stone saw-sharpening bench complete with files and so forth. And a very large water-trough hewn from a block of stone, filled with cold water and lined with calcite crystals.

Brislington War Room (Region 7)

For the Cold War enthusiasts, the last site visited on the Saturday was a creeper-covered two-storey windowless concrete bunker at the rear of a government offices site at Brislington, just to the east of Bristol. The lower floor is below ground level. This structure remains in use as a store, although only a few rooms on the upper level are in use for this purpose. The structure is of particular interest in that it is substantially intact, with many of its fixtures and fittings still in place, including ventilation plant. The star attraction was, perhaps, a message-handling contraption (by Lamson) for conveying papers between the upper and flower floors - with a stated `safe working load of, I think, seven pounds (or it may have been ounces!) The bunker freaks photographed everything, whilst the rest of us, having satisfied our curiosity, enjoyed sunshine on the grass outside.

Saturday night

The formal Saturday-night dinner was socially, at least, quite splendid. The meal in itself and the service unremarkable. The Italian schoolchildren clearly thought us a very odd bunch, and took turns to gaze at us. The evening concluded with a well-informed presentation, drawing on a considerable amount of primary research, by David Hardwick

Study Weekend 2006

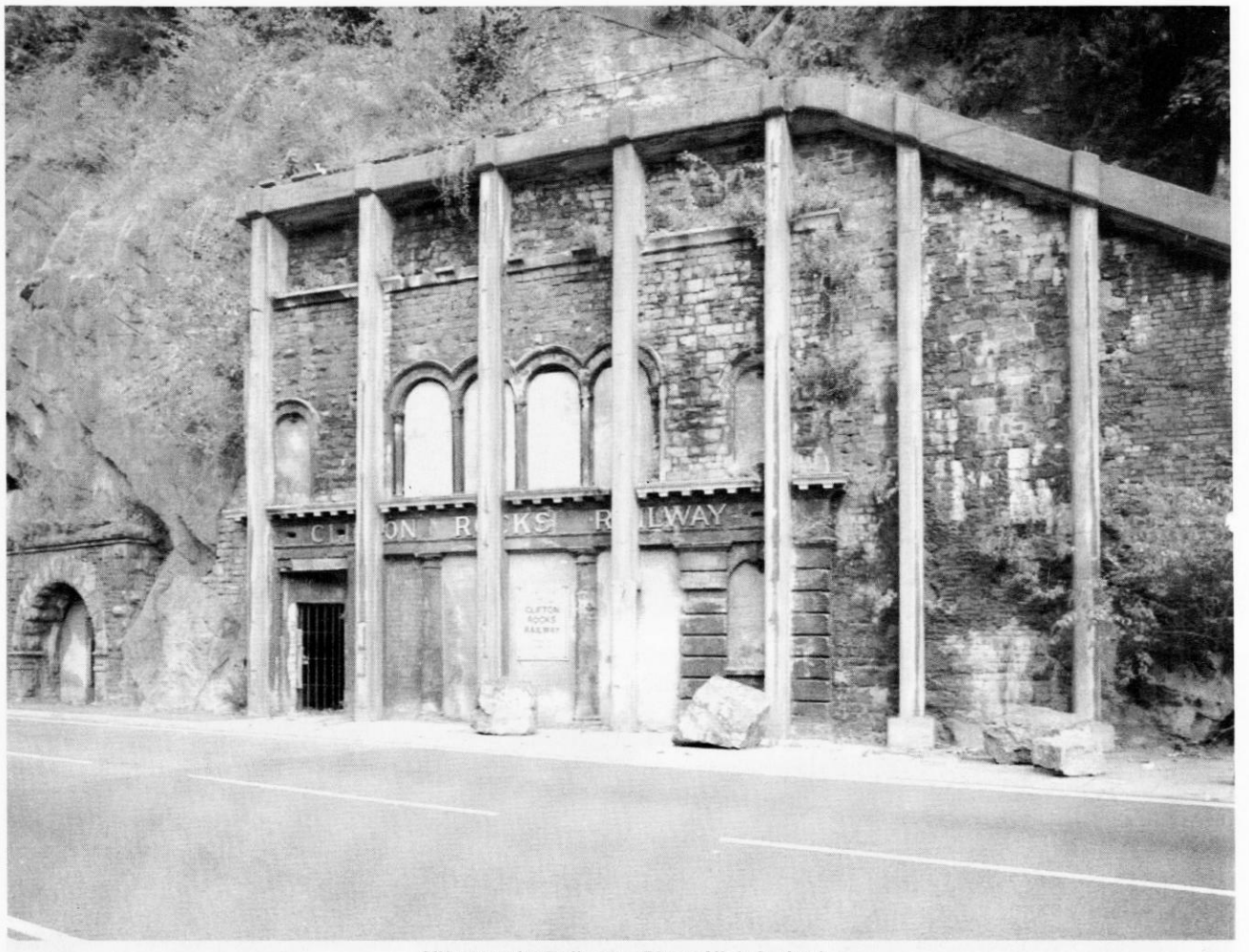
Brislington War Room - Photo Nick Catford

speaking on the coal mines of south Gloucestershire. In the absence of an on-site bar, Linda and Martin had thoughtfully arranged for a supply of beers and soft drinks in the meeting room. This meant few if any deserted the campus for the nearest pub several hundred yards away near Westbury-on-Trym.

Redcliffe `caves' (sand mines)

Sunday's excursions commenced by the waterside at St. Mary Redcliffe, just outside central Bristol, where a very knowledgeable and enthusiastic member of the Axbridge Caving Group showed us around underground, and explained all that was to be seen easily, all that was to be seen (had time permitted) with difficulty, and all that once could be seen, but was now quite inaccessible. The plot is of sand-mining for brown or green bottle-glass (the red sand has a high iron oxide content), numerous secondary uses, connections with a now demolished shot-tower, and with the disused Harbour Branch railway tunnel which passes very close. Much merriment was occasioned by our guide informing the writer that he need not write everything down, as 'it is all on the web-site!' Your not very electronic reporter has in fact visited, and recommends, this web-site. Google via Axbridge Caving Group and/or Redcliffe Caves will find it.

Study Weekend 2006



Clifton rocks Railway - Photo Nick Catford

Here again, party size dictated two successive groups underground. Attractions for those on the surface included the nearby science and technology museum, the Redcliffe waterside area, and a handy pub. There are public guided tours of the Caves of which details can be found on the internet. And our guide extended an invitation to anybody who would like to crawl around the less readily accessible tunnels to get in touch to arrange another visit.
The packed lunch from Hiatt Hall does not call for a paragraph, or plaudits!

The Clifton Rocks Railway

Here again, as at Redcliffe, the Clifton Rocks Railway Trust has put much relevant information on a web-site, so an abbreviated report is presented here for those, like myself, who remain resolutely not-very-electronic. This is the only four-track funicular railway built inside a tunnel in the world. There is a still-operating two-track one (and also an open air one) at Hastings in East Sussex. The tunnel was excavated inside the cliff on the Clifton side of the Avon Gorge, just beside Brunel's suspension bridge. Services between Hotwells (at the bottom) and Clifton (at the top) commenced in 1891 but ceased in 1934. The steeply inclined tunnel lay derelict until World War II, when it was adapted to incorporate workshops for making barrage balloons (at the top), air-raid shelters (in the central part), and BBC studios (at the bottom.) There are steep narrow stairways down each side, from which the several spaces can be accessed, perhaps the most interesting of these being the derelict studios at the bottom. There is at present access to the tunnel only at the top station which with most of the tunnel is the property of the adjoining hotel. Thus a full tour calls for negotiating all the stairs down, and all the stairs up again. The bottom station is (or part of it is) the property of the City of Bristol, who deny access by way of the locked door with only a very narrow bit of pavement and the heavy traffic of the A4 just outside.
The tremendously energetic and enthusiastic Friends of the Clifton Rocks Railway have worked wonders at the top station. The ornamental railings surrounding it have been restored to their original condition, and the upper station substantially restored. This now houses an impressive display of historic photographs and other documents. Heavy ironwork including at least one original turnstile has been laboriously hauled

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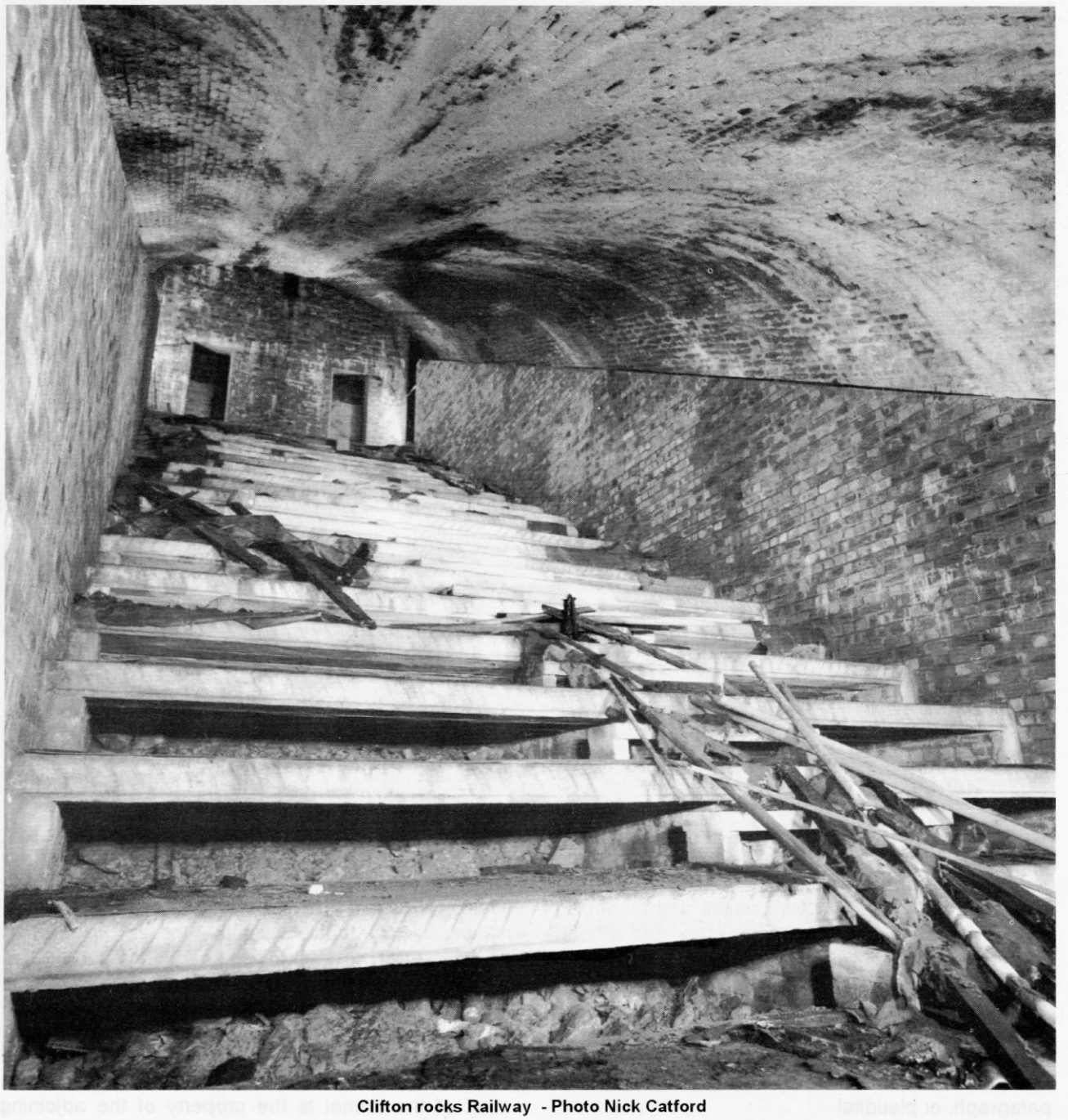

Clifton rocks Railway - Photo Nick Catford

back up the steeply sloping tunnel and reinstalled in its original position. Also to be seen here is a mysterious small diameter tunnel (presumably pre-dating 1891) the entrance to which has been uncovered by the Friends' work.

All rubbish cleared from the depths of the tunnel, much of it builders' rubble left over from the World War II conversion work, has to be carried up to the top station for disposal. The Friends missed a trick here, as most of us I am sure would have readily carried a bucketful of half bricks each up for them! Perhaps they did not have 45 buckets to hand.

The Friends arrange guided visits on request, and have shewn groups of the public around. They have on sale at the top station an assortment of postcard views of the tunnel, and two modestly priced short guide-books, Clifton Rocks Railway by Richard Hope-Hawkins (a Sub Brit member) and Clifton Rocks Railway: the BBC's wartime fortress by Gerald Daly.

There was much discussion by those present concerning how best to proceed with the conservation and presentation of this site. One school of thought advocates partial or complete restoration of an operating funicular railway, which

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would of course mean the destruction of much or all of the World War II structures. This would allow easy access to the bottom and back, but depend on destruction of what are arguably the most interesting features. And it is difficult to believe that the capital and operating costs of reinstating and operating a passenger service, probably operated only during restricted days and hours, could be met by any likely income from ticket sales. Few people in their right minds are likely to want to walk alongside the A4 to enter by the bottom station, even if Bristol City were to allow this.

Another, and perhaps more realistic, option is to restore the BBC studios to some semblance of their original appearance. But visitors would have to descend and re-ascend several hundred steps in narrow stairways, so guided small groups of the fit and able seems the only option. And as we discovered during our own visit, it is very difficult for a group of 20 or so to hear everything the guide has to say in these cramped conditions.

What has been done so far is a mock-up of the upper end of a funicular rail car on a clear section of quadruple track, visible from the top station. Perhaps a publicly visitable circular guided tour through one or two of the top rooms (with displays installed) in the tunnel, whilst still calling for quite a lot of steps up and down, might be feasible for regular public visits. With longer tours to the lower reaches occasionally on offer to the fitter members of the public.

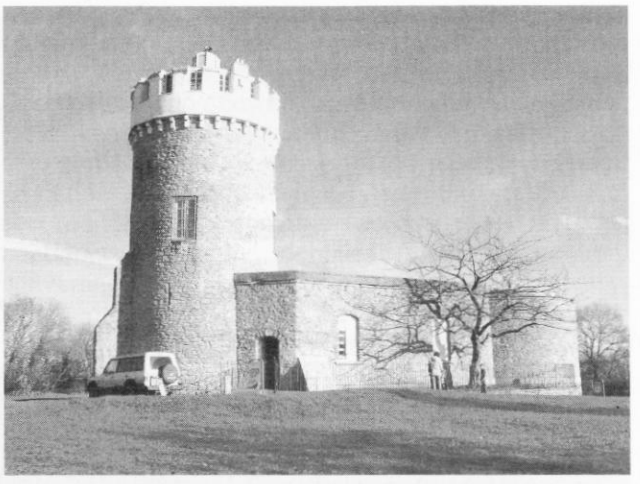
My own feeling is that English Heritage, if interested, might regard the World War II installations of sufficient importance in their own right to preclude their

destruction to re-install an operating railway of questionable economic viability.

The Giant's Cave and the Camera Obscura on Clifton Down

Coming straight from the many steps in the funicular railway tunnel, we next encountered many more such at the final site for the weekend. The stone tower overlooking the suspension bridge, a former windmill, has for some decades been kitted out with a `camera obscura' at the top. There is another of these on the Outlook Tower near the Castle at Edinburgh, and I believe one at Eastbourne as well. It is a small darkened room in which you stand around the walls gazing at a horizontal dish-shaped white painted circle in the centre. Onto this, by an arrangement of lenses and mirrors (or maybe only one of each) is projected a view of what is to be seen from the top of the tower. By operating a movable handle, passed from person around the people in the room, it is possible to rotate the whole contraption to see the view outside in all directions.

Of course, you can see just the same view through the windows of the gallery surrounding the little room!



Camera Obscura on Clifton Down

However, even the most electronically besotted Sub Brit members present seemed captivated by the coloured moving coloured pictures inside the darkened room - with not a red or green LED or any beeping or squeaking sounds to keep them happy! Somehow the waving branches of the trees, the people walking about the Down, and the toy cars crossing the bridge all seemed much more interesting than when observed directly.

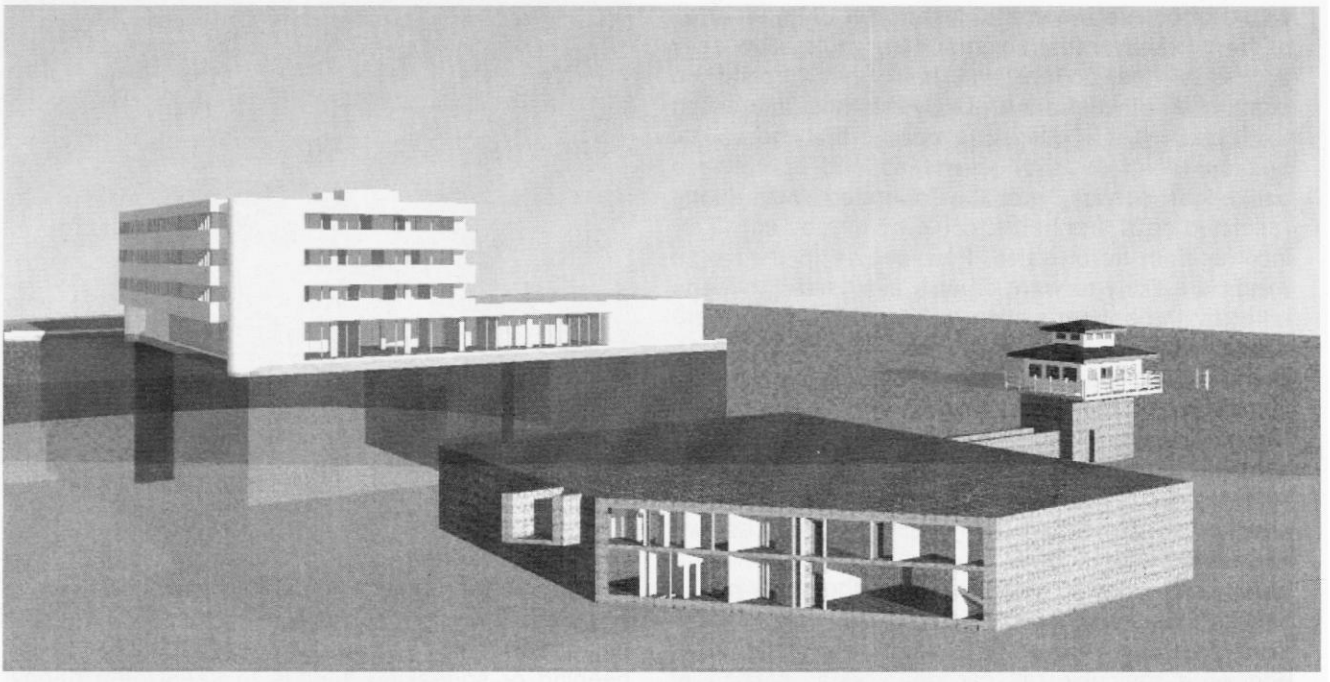
Below the tower is a natural cave, artificially extended (so making it a valid Sub Brit site visit), to give access to an open viewing platform in the cliff face, and extensive views up and down the gorge. With care, one can spot traces of the two railway lines, in places in tunnel, which run or ran down each side of the Avon here. That to Portishead has recently been re-opened (although I think only to freight traffic), whereas that to Avonmouth is out of use, although the latter place continues to enjoy a passenger rail service from Bristol via Stapleton Road and a tunnel under Clifton Downs.

So ended a splendid weekend

Several members stayed on an additional night at Hiatt Baker, and some took up the option of visits to two historic coal-mine sites in the Bristol coalfield on the Monday. Thanks to Linda Bartlett and Martin Dixon for organising yet another most enjoyable and interesting event. There was no long weekend in mainland Europe this year, in view of Linda's and Martin's retirement from their employment with British Airways more or less coinciding with the usual date. We are as ever very grateful to them, and especially this year for organising this study weekend, a little later in the year, instead. Martin entertained us all weekend with his inimitable jokes and both of them good-humouredly put up with all of us and especially your disorganized and quirky reporter throughout.

From Paul W. SOWAN

Continental Airlines Texas Bunker

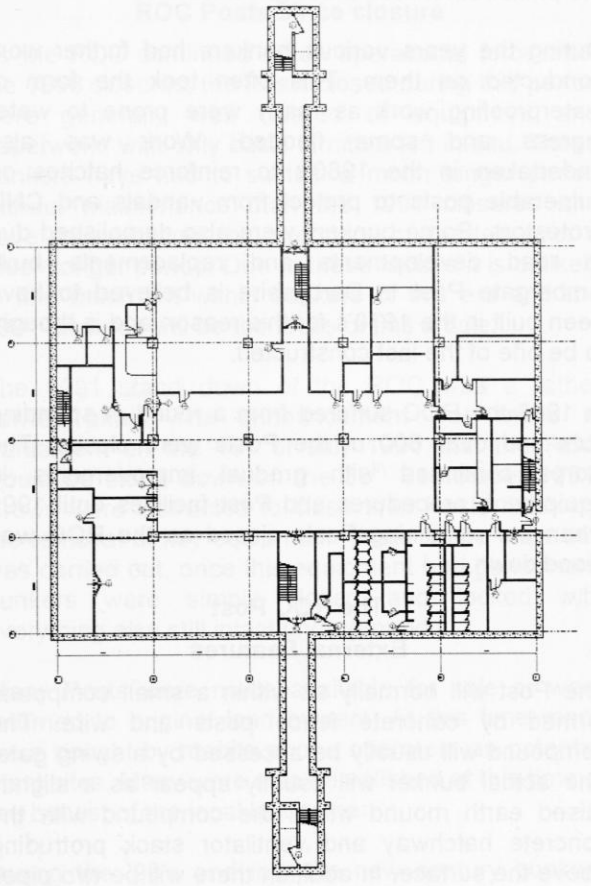


MONTGOMERY, Texas -- The 40,000-square-foot, two-story bunker here was the creation of Ling-Chieh "Louis" Kung, the nephew of Taiwan's influential Madame Chiang Kai-shek. The fortune he earned during the booming 1970s from his now-defunct Houston oil company, Westland Oil Development Corp., allowed him to indulge his fears that Red China or the Soviet Union would launch a nuclear attack on the U.S. Mr. Kung, who died in 1996 at about the age of 75, bought hundreds of acres of wooded cow pasture on the edge of this small town and secretly built an underground fortress to house at least 700 people, including his employees and their families, for a two-month emergency. Now, Continental Airlines, for reasons of its own, has taken over part of the extravagant Cold War folly, with plans to use it as a crisis-operations centre. The destruction and panic wrought along the Gulf Coast by Hurricanes Katrina and Rita last year prompted many companies to seek new places to house emergency operations. Continental had an emergency-operations centre near Houston's George Bush Intercontinental Airport and it has offices downtown. But concerned about gridlock, floods and possible electrical outages in a hurricane, the company decided it needed a safer backup facility to operate its world-wide flights if it should ever have to evacuate its Houston headquarters. The airline, along with more than 20 other companies, found its solution buried deep inside a hill in this small community northwest of Houston.

In May, John Stelly, Continental's managing director of technology, was given 45 days to convert the rented shelter space for emergency offices and data storage. After descending more than 50 feet in an elevator to survey the project, he found himself in a subterranean ghost town of shadowy halls, mysterious rooms and dust-covered equipment. The executive says he stared in wonder at a room filled with 115 triple-decker bunks, each with an individual reading light. Later, as he went to work there, he sometimes imagined what it would be like to be trapped in this place for months with hundreds of other people. "It gives you a weird, eerie feeling," he said. The world was awash in old fallout shelters after the Cold War ended in 1989. Over the years, many public and private bunkers in the U.S. and Europe have been converted to wine cellars, nightclubs, storage facilities and even mushroom farms. A bunker secretly built in White Sulphur Springs, W. Va., to house Congress is now rented out to the public for parties and showcased in guided tours. Many other old shelters have been marketed as secure data centres or emergency headquarters for companies. Adam Laurie, who renovates and leases ex-military bomb shelters in the United Kingdom, toured Mr. Kung's Texas bunker three years ago. Though he was impressed with the quality of construction, "the degree of paranoia of the person who built it was extreme," he said. The bunker was as self-contained as a small city, with its own power and medical facilities, morgue, jail cells, recreation rooms and water tanks. Two pagoda-style buildings outfitted with gun ports for machine guns protected stairwell entrances to tunnels leading into the shelter. In case of an attack, the tunnels were designed to collapse, sealing off the bunker from the outside world. Two hundred feet away, an above-ground, four-story office-building with bulletproof windows housed Mr. Kung's oil-company headquarters and

Continental Airlines Texas Bunker

family residence. From the start the project, completed in 1982, was a source of intrigue and gossip for the town of Montgomery. Residents watched as a mile-long procession of cement trucks ferried cargo to what they knew only as a giant hole in the ground. Rumours swirled for years of a secret subterranean shopping mall. "Everybody's heard about it. Everybody's curious about it. Not everybody's seen it," said Jennifer Stratton, a waitress at Phil's Roadhouse & Grill down the road from the bunker. Mr. Kung lost title to the property after the 1980s oil bust. The bunker sat frozen in time until investors bought it and in 2003 hired Montgomery-based Westlin Corp. to take charge of converting it into a rental site for data storage. A quick survey of the property made it clear this would be no ordinary renovation. Using a flashlight to light his way, Westlin President David Herr says he made his way past wasp nests and thick cobwebs to the underground stairwell, then through two reinforced steel blast doors that slammed shut behind him. A cutaway of the complex built by Ling-Chieh 'Louis' Kung. In the bunker's control room, the panel where flashing lights would signal a nuclear attack was still mounted on a wall with the key in the slot for locking down the facility. Geiger counters for measuring radioactivity remained on water and ventilation



systems. Mr. Herr quickly saw that some of the rooms would be easier to convert than others. Decontamination showers have been left alone since they might still prove useful in a chemical spill or other emergency. Westlin installed a small elevator so tenants wouldn't have to take the stairs, and secured it with biometric access that requires handprints to verify identities. The company is converting 13 small conjugal rooms, originally intended to give couples privacy, but Mr. Herr and his staff are still puzzling over what to do with some of the space. For example, four steel-encased jail cells remain untouched with their original bed frames and doors because they are too small to bother updating. Interest was only lukewarm when the bunker opened for leasing in early 2005. That changed after Hurricanes Katrina and Rita, with the number of bunker tenants doubling to 50, including Continental, the largest occupant. Other tenants include Anadarko Petroleum Corp. and medical companies from Houston and Louisiana. Continental spent several million dollars -- it won't say exactly how much -- to customize its bunkhouse space and additional space leased in the nearby office building. Once the lease contract was signed, Mr. Stelly had to rush to complete the conversion of the company's 2,000-square-foot bunker space before this year's hurricane season. Workers had to tear down one wall, a job that usually takes a couple of hours. In this case, it took two days' labour with a sledgehammer to break up the two-foot-thick steel-reinforced concrete. When power and air-conditioning units proved too big to get down the elevator, workers had to dig down through the earth to reach the corrugated-steel tunnels and peel back the top panels so the equipment could be lowered in by crane. Continental's executives have decided they will activate the bunker in a Category 3 storm, or whenever workers must evacuate the downtown Houston control centre. The airline's space leased in the above-ground office building is for 275 emergency staff. Only a few workers will be needed in the bunker. Tomorrow, Continental plans to operate a work shift from the site and hold an open house and barbeque so employees can bring their families to see the bunker. If history is any indicator, not everyone will be interested in the tour. Mr. Stelly said some Continental employees who have already been to the facility have preferred to wait up top rather than descend into the depths of the bunker. "It can give you that claustrophobic feeling," he said.

Wall Street Journal, October 2, 2006, Page A1

Cold War Relic Gets New Use By Companies Worried About the Next Big Storm

By Melanie TROTTMAN

Traces of the ROC – The Post Bunker

Introduction

The Royal Observer Corps (ROC) manned and maintained a large number of small underground concrete bunkers from the late 1950's through to the early 1990's. These were located throughout the UK and were designed to enable their crews to report and monitor the effects of a nuclear strike on the country with some degree of protection from the external surface conditions.

Following the stand down of the ROC these bunkers were abandoned. Although many are still securely locked, many have also been demolished or vandalised. Fortunately, 15 years after the stand down, there are still bunkers in good condition around the country which are also open and readily accessible. This article gives a brief history of the bunkers and describes what can be found in the field today.

The ROC goes underground

The ROC's aircraft reporting role was slowly downgraded in the 1950's until a new initiative resulted in the Corps taking on a Nuclear reporting role. This new role was essentially 3 fold

- Warning the public of attack
- Recording and reporting the strike
- Monitoring the subsequent fallout

In order to do this a new range of equipment was developed and a new form of structure was devised. This structure was essentially a concrete box situated underground, its construction and location being devised to protect the crew and instrumentation from the worst of the effects of an above ground nuclear strike. Previous wartime and post war above ground aircraft reporting structures had been known as 'Posts' and so the name continued.

The prototype post was built in Farnham in 1956 and following initial tests a slightly modified version became the standard design. During the late 1950's and into the '60's the bunker building programme continued with a total number of approximately 1563 finally being built. The majority of these bunkers were to the standard design, although there were some regional variations – for example some GZI mounts were positioned on extended concrete pillars. Occasionally bunkers were built with the internal layout being located on the opposite side of the monitoring room to the standard design (the Post at Middleton Stoney off the M40 is a good example). This would seem to be a mistake by the original contractors in interpreting the plans rather than a designed feature.

During the years various bunkers had further work conducted on them. This often took the form of waterproofing work as many were prone to water ingress and some flooded. Work was also undertaken in the 1980's to reinforce hatches on vulnerable posts to protect from vandals and CND protestors. Some bunkers were also demolished due to road developments and replacements built. Ambergate Post in Derbyshire is believed to have been built in the 1970's for this reason and is thought to be one of the last constructed.

In 1968 the ROC suffered from a round of spending cuts and over 600 of the Posts were closed. The Corps continued with gradual improvements in equipment, procedures and Post facilities until 1991 when the remaining Posts closed as the ROC was stood down.

The ROC Post

External Features

The Post will normally sit within a small compound formed by concrete fence posts and wire. The compound will usually be accessed by a swing gate. The actual bunker will usually appear as a slightly raised earth mound within the compound with the concrete hatchway and ventilator stack protruding above the surface. In addition there will be two pipes

Traces of the ROC – The Post Bunker

at the surface which will drop down to the monitoring room below. During service the larger pipe would have been attached to the Fixed Survey Meter (FSM) and the smaller to the Bomb Power Indicator (BPI). The readings from these devices would have been taken from the safety of the room below.

The mound itself may have steps leading to it and some sites would also have had steps and gates in hedgerows thus allowing access to the site itself.

All sites had a telephone line feeding into the monitoring room. This usually came by overhead line and the presence of telegraph poles leading to the Post compound can be a good way to identify a Post location. In cases where an underground line went to the Post there is usually a small silver coloured GPO box within the compound.

Posts were arranged in 'clusters' of usually 3 or 4 and each cluster had a Master Post. These Posts had radio communications equipment and can be identified by the metal 'top hat' cover attached to the stand alone ventilator shaft. This covered connection points to the room below. A fixing bracket on the other side of this shaft and concrete blocks containing guying loops for the aerial mast are also signs of a Master Post.

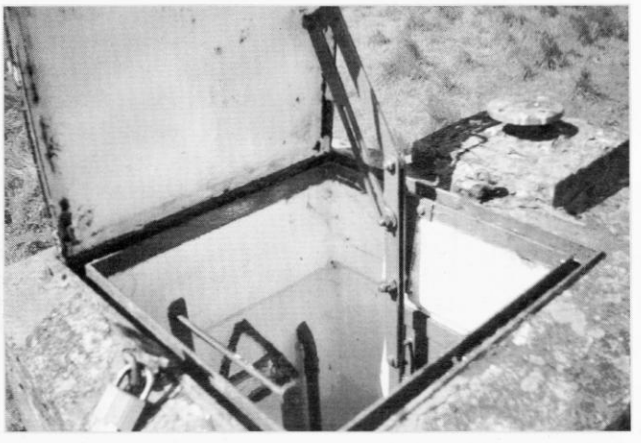
ROC Posts since closure

As the ROC continued as an operational force after the 1968 closures, the Posts closed during this period were generally well cleared of equipment and paperwork, with only basic furniture left in-situ. These bunkers have had to sustain a much longer period without maintenance than the 1991 closures and have also received the attentions of vandals over a much longer period. Due to these factors it is unlikely to find much left within bunkers of this era and the 1991 closures will be the focus of this article.

The 1991 stand down of the ROC was a rather hurried affair. The announcement was made in Parliament on the 10th of July 1991 that the ROC would be stood down on the 30th September 1991. Crews were instructed to close their Posts following the removal of key equipment. While in the main this was carried out, once this equipment had gone many bunkers were simply closed and locked with everything else still intact underground.

Many Posts were made available for sale or were returned to original land owners. At this time many were bought by mobile phone operators as potential mast sites. Many were also demolished at this time at the behest of the local landowner.

During the '90's and into the new century bunkers occasionally become available to the public as the phone companies sell up sites they haven't used or original buyers move on. Prices have steadily risen due to planning permission speculation on the plots; the spectacular locations of some of the sites and also an increasing interest in the Cold War in general.

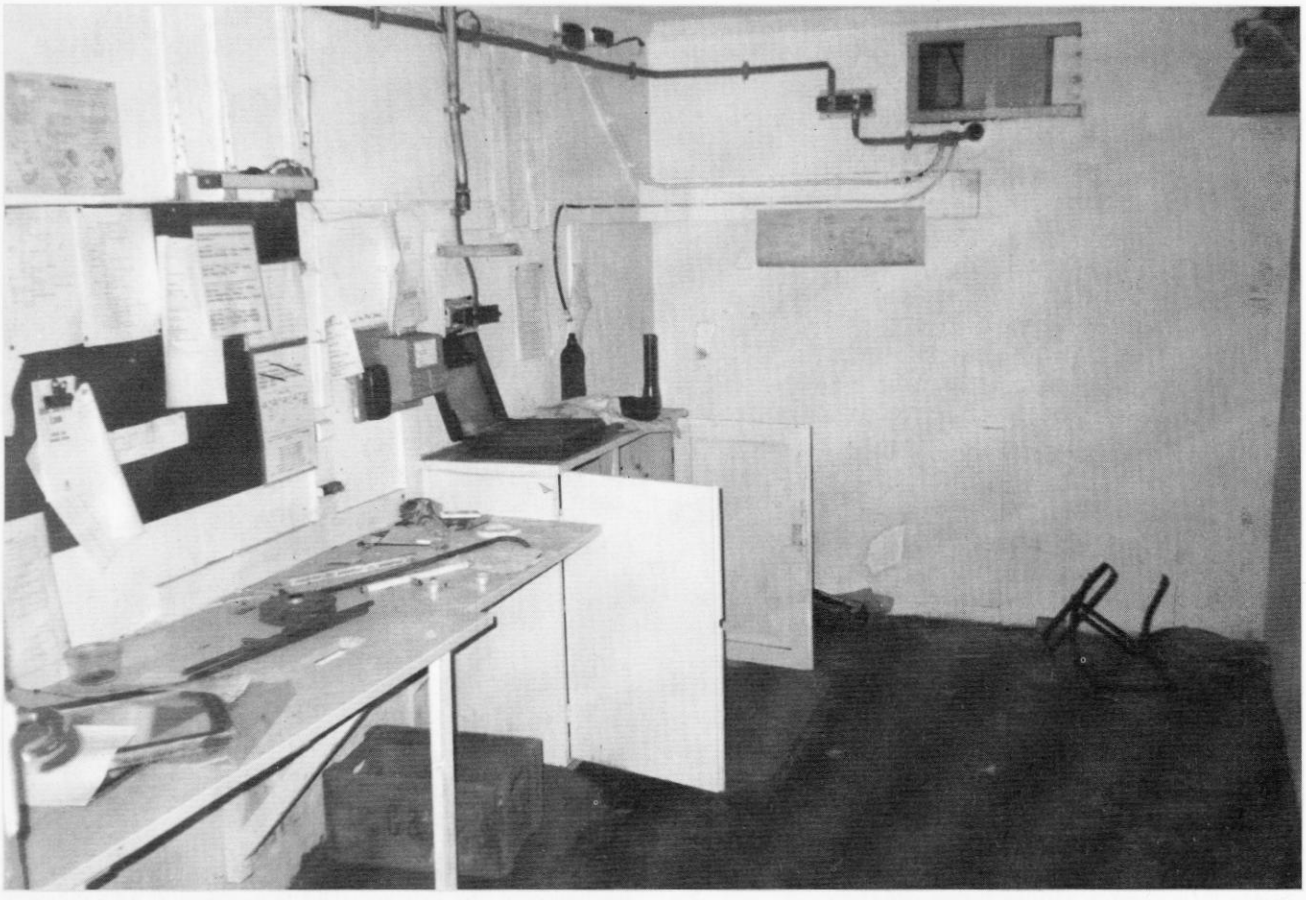


How to locate a Post

The best resource on ROC Posts can be found on the Subbrit website. This will give a Grid Ref and description of the location and also a description of the condition of the Post at the time of the visit. Multimap, or some other web based resource, can then be used to generate a detailed map of the local area with the location of the Post indicated. If the internet is not available then location Grid Refs can also be found in 'Attack Warning Red' by Derek Wood.

Many Posts can be found off narrow country lanes and although some had car parking spaces and were close to the road, reaching the majority usually involves some walking. This said, a large number are now close to existing public footpaths, so access can be relatively easy.

Traces of the ROC – The Post Bunker



When at the approximate location it can still be difficult to find the Post. Many times this is because hedgerows and other features can obscure the Post when viewed from a distance. It is always useful to have the description of the site with you so that prominent local features can guide you to the location. Posts can still be hidden due to undergrowth obscuring the surface features and it is often easier to look for the distinctive concrete fence posts of the Post compound. Telegraph poles ending in the middle of fields can also be a useful guide.

Entering a Post

Hatch covers were usually secured by folding metal hasps (attached to the concrete surround) over metal loops set in the hatch lid. A padlock would then secure in place. On some Posts a locking bar could be slid into place and padlocked as well. There was also an internal locking mechanism which could be operated from the outside by a 'T bar' key. A small slot in the hatch cover allowed the key to be inserted. Turning this would rotate the mechanism allowing it to clear the inside lip of the hatch frame and so release the hatch cover.

Today, many Posts can still be found fully secured with the original Chubb padlocks and should be left as such. However, there are also many Posts where the padlocks have since been removed and access may be possible. In these cases the Posts can still be relatively secure as the metal hasps are often found rusted or jammed over the hatch cover. These can be levered open with a strong screwdriver with no damage ensuing. The hatch may still be secured by the internal locking mechanism but this is rare now.

Once open, the hatch cover should be easy to lift due to the counterweight and a notch in the stay mechanism will allow the cover to be secured in an open position with no fear of it falling shut. Before descending check that the metal ladder is securely fixed to the wall of the access shaft and take care when moving past the counterweight. Particular care should be taken in avoiding the counterweight on exiting the bunker as it is easy to hit your head on it.

Internal features

At the bottom of the ladder you will alight on a metal sump grill and will be adjacent to the toilet cubicle and the monitoring room. These both have lockable doors which are usually now found unlocked and open. The Elsan type toilets are sometimes still in place and there is usually evidence of cubicles being used for storage as well.

The monitoring room will usually retain the basic

Traces of the ROC – The Post Bunker

furniture of work table and cupboard. It is now rare to find the original fold up canvas and wood chairs and if there is seating it is usually later plastic stackable chairs. Bunkbeds were removed when the Posts were closed in 1991, however they were not from the 1968 closures, and so it is still possible to occasionally find them in situ. Shelving and various additional cupboards can be found in many Posts where Observers have added to the standard equipment over the years.

Lighting and electrical features may still exist and these can include the battery switching box, the lighting timer and various cables used for power, communications and lighting circuits.

Remaining equipment

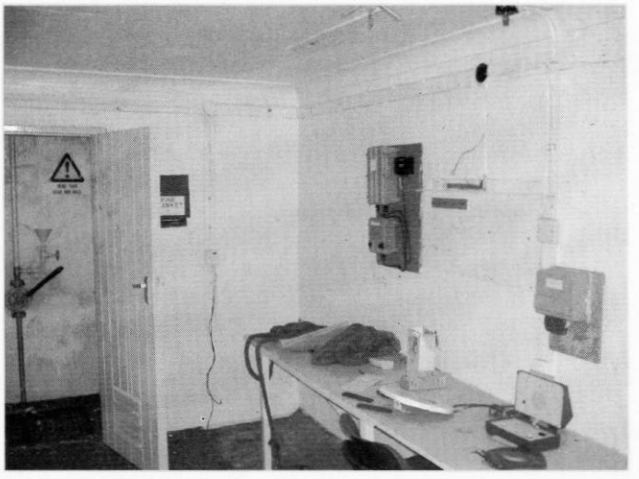
While many Posts can still be found with the basic features, as mentioned above, some Posts can be found with equipment and paperwork still in place, giving a unique insight into the environment the Observers worked in.

Occasionally the WB1401 warning systems can still be found in the Posts. These are mounted on the wall and consist of a grey filter unit and armoured speaker. Warning messages would be broadcast to the Observers using this system and would be the first indication that an attack was imminent. 'Teletalk' units can also sometimes be found. These were latterly provided by BT and were the main communications link between the Posts and the Group Headquarters bunker. The 1980's versions of these were blue 2 piece units which opened out when in use to expose the control buttons. The Teletalk unit in the Post at Llanfair Talhaiarn, near Abersoch in North Wales, was not only still in situ in 2006, but was also still connected to a BT line. When opened the call button still lit up and static could be heard over the speaker !

Notices, procedures and official letters can sometimes be found. For example Cold Overton in Leicestershire has a whole range of paperwork including an invitation to the Battle of Britain 50th Anniversary Flypast at Buckingham Palace in 1990.

Visitors log books are rarely found now but can give an insight into the comings and goings at the Post. Training information and ROC magazines are still occasionally found as well.

Burndept BE525 radio units were used in the '80s & '90s in Master Posts. These were removed at stand down, although the odd handset can sometimes still be found in situ. Prior to the introduction of this system a much larger radio unit seems to have been in use, an example being found in a Post in West Wales recently.



In addition to the issued equipment, examples of home made equipment can be found. Items include Maroon trainers (pyrotechnic devices used to warn the public) and weather vanes (the ROC had a secondary meteorological reporting role). A home made Bomb Power Indicator (BPI) training unit was also recently found in a Post in Cornwall (Above).

Summary.

The number of ROC Posts in good condition is reducing as time moves on, but, 15 years after stand down, there are still some very good examples nestling in the corners of farmer's fields waiting to be rediscovered. Finding and reading notes from old exercises detailing the spread of fallout across the UK in the dimly lit interior of one of these bunkers can be a very evocative reminder of what could have happened and what is increasingly becoming part of our collective past.

Sources:

Attack Warning Red – Derek Wood (1992)

Subbrit ROC Database - http://www.subbrit.org.uk/rsg/roc/index2.shtml

From Mark Dalton

Uncle Joe knew where you lived

The story of Soviet mapping of Britain (part I)[1]

By John Davies - Previously Published in Sheetlines The Magazine of the Charles Close Society

It is a spine-chilling fact. Every Soviet president from Stalin to Gorbachev, and all their high-ranking officers, knew not only where you lived but how to get there by tank. They knew the width of the roads, the height of the bridges, the depth of the rivers, the names of the streets. And they knew the exact location and purpose of every building of possible strategic importance, even those which were omitted from OS maps.

For over fifty years, before during and after the cold war, the Soviet military undertook the most comprehensive global survey ever attempted and created detailed, accurate maps of practically every country in the world. For many African and Asian countries these maps are, even today, the most reliable or only open source of good quality topographical information.

This top secret enterprise was on a vast scale, driven by military imperatives and executed to the highest technical standards. Today, very little is known about how the organisation was structured and how such incredible results were achieved. The achievement is particularly astonishing when compared with the regime's inability to fulfil industrial and agricultural production targets and its failure to feed the people.

Almost the only information available is the evidence of the surviving maps themselves, supplemented by the stories of those who became involved after the collapse of USSR. The present account has been compiled from such sources and is therefore inevitably incomplete and somewhat tentative. No doubt more information will come to light in due course. However, no history of Soviet military mapping has yet appeared in print in English and this represents an attempt to establish some of the facts. Part one comprises a general description of the maps and the circumstances of their production. Part two will tell the story of their emergence in 1993 and provide a closer look at the map content and the probable sources of information.

World mapping

The scope of the Soviet mapping initiative is staggering:

- the whole world[2] was mapped at scales of 1:1 million, 1:500,000 and 1:200,000[3];
- most of Asia, Europe, northern Africa and North America was mapped at 1:100,000;
- USSR and much of Europe, the Far and Near East at 1:50,000;
- USSR and eastern Europe at 1:25,000;
- about a quarter of USSR at 1:10,000.

In addition plans at 1:25,000 and 1:10,000 were produced of thousands of towns and cities around the world. These latter are particularly interesting for the level of detail shown, much of which could only have been gathered by having a local presence; easier in friendly countries than elsewhere.

The military machine realised the importance of accurate topographic mapping for military, economic and political purposes almost immediately after the Russian revolution. A military cartographic administration was created in 1919 and began to make geodetic and cadastral surveys of significant parts of the new Soviet Union.

The earliest British map example seen so far is dated 1938[4], indicating that the global project was under way before World War II. In the mid-fifties a new 'Sofia' standard was established and worldwide mapping activity intensified during the cold war. The latest maps seen date from as recently as 1990[5].

The most striking feature of the maps is that all text and place names are printed in Cyrillic script, causing familiar places to look quite unfamiliar. Foreign names are transliterated phonetically so that a Russian speaker could easily read and pronounce them. London appears as ЛОНДОН, Paris as ПАРИЖ. This is particularly helpful with places having non-obvious pronunciation. Gloucester, Leicester and Dun Laoghaire appear as ГЛОСТЕР ('Gloster'), ЛЕСТЕР ('Lester') and ДАН-ЛЗРЕ ('Dun Leary') respectively.

One standard global sheet numbering system is used, the International Map of the World system, which provides a simple and comprehensive indexing method. The globe is divided into latitudinal bands four degrees deep and longitudinal zones six degrees wide. The bands are coded A-U working north from the equator and the zones are numbered 1-60 working east from longitude 180° (the date line). Thus, grid square M30 lies between latitude 48° and 52° north and between longitude 0 and 6° west (S.W. England). M31 contains S.E. England, northern France and Belgium, whilst most of Ireland lies in N29 (lat. 52°-56°N; long. 6°-12°W). The band letters are repeated south of the equator, with a prefix.

1. Part II will appear in the next Issue of Subterranea.
2. Taken from *www.cartographic.com/documents/russian.pdf.*
3. Western military surveys used 1:250,000 for medium scale planning maps, but communist countries preferred 1:200,000.
4. 1:1 million sheet M30 dated 1938.
5. Town plans of Bradford, Bournemouth and Brighton are all dated 1990.

Uncle Joe knew where you lived

Nomenclature

The 1:1 million map sheets each cover a single grid square (except in the far north) and are named accordingly (M30, N29 etc). Larger scale sheets are numbered as divisions of these:

- there are four 1:500,000 sheets per grid square, with suffix А, Б, В, Г (the first four letters of the Russian alphabet). The suffix is applied from top left to bottom right,
- there are 36 1:200,000 sheets per grid square, with suffix I to XXXVI,
- there are 144 1:100,000 sheets per grid square, with suffix 1-144,
- there are four 1:50,000 sheets for each 1:100,000 sheet, with suffix А, Б, В, Г,
- there are four 1:25,000 sheets for each 1:50,000 sheet, with suffix 1-4.

Thus, for example, 1:50,000 sheet M-31-1-А occupies the top left hand corner of sheet M-31-1, the 1:100,000 sheet which itself occupies the top left hand corner of grid M31.

Sheet lines rigidly adhere to the graticule; no exceptions are made for bits of land jutting off the edge. Sheet sizes vary but those of UK are typically about 450-600 mm high by 300-500 mm wide (paper size). Town plans, however, are positioned regardless of graticule lines and may comprise several sheets, each of much larger size.

This graticule is also the basis of the projection, Gauss-Krüger, a version of the UTM system. This can be best explained by starting with the familiar Mercator projection. In the Mercator projection, the globe is mapped as if a cylindrical sheet of paper touches the globe all round the equator. This provides low distortion near the equator, but poor representation further away where most populated places lie. This problem is overcome by Universal Transverse Mercator (UTM) whereby the cylinder is rotated so that the tangent is along a line of longitude instead of the equator. In fact UTM has 60 such tangents, each along the central meridian of the 60 longitudinal zones. This preserves the linear scale along the central meridian with low distortion within each zone, but it is difficult to combine maps of different zones. The Soviet implementation of Gauss-Krüger is based on Pulkovo 1942 datum on Krassovsky 1940 ellipsoid[6].

Specifications of style, colour, typography and content are standard throughout, and there is an exceptionally detailed and comprehensive manual of symbols to identify topographic features, places, buildings, industrial works, type of agriculture, soils, vegetation, hydrography and so on[7].

Maps of the British Isles

The small scale maps (1:1 million, 1:500,000, 1:200,000, 1:100,000) cover the entire British Isles. Examples have been seen of particular sheets[8] having dates of both 1960s and 1980s indicating that there was at least one complete revision of each series. Printing is in six colours.

The 1:1million sheets and 1:500,000 sheets have contours at 50m intervals and show roads, railways, canals, rivers, reservoirs, forests, shipping routes, spot heights and features such as airfields, lighthouses and monuments. Places are named in different size of script according to population size. Both have small ancillary diagrams showing county boundaries and disposition of adjacent sheets. The 1:1 million map also has hill shading.

The 1:200,000 sheets are similar but with more detail, such as pylon lines, arrows to show direction of river flow and 40m contours. Major roads are annotated with information about width, clearance and carrying capacity of bridges. On the back of most 1:200,000 sheets is a full written description of the territory under the headings 'Population Centres', 'Transport Network', 'Relief', 'Hydrography', 'Vegetation', and 'Climate', with a geological diagram.

The style of the 1:100,000 sheets is again similar but with much more detail. Contour interval is 20m, submarine contours are at 2m, 5m and 10m depths, roads are labelled with national and European road numbers, urban areas are coloured salmon and smaller built-up areas black. Additional details include quarries, footpaths, embankments, cuttings and frequent spot heights and depths. No paper sheets at 1:100,000 seem to exist of Ireland, but reprographic material did exist and raster copies are available[9].

1:50,000 series

Paper sheets at 1:50,000 scale, dated 1980-82, exist for the southern part of England and Wales[10]. It is believed that much of the rest of the country was mapped at this scale and reprographic material produced ready for printing. It is also likely that an earlier series was produced in 1960s, but if so, no examples have been seen[11]. General appearance and standards are as 1:100,000 but the contour

6. For more about the Pulkovo Observatory see *www.confluence.org/confluence.php?visitid=7270*.
7. See *www.rkkaww2.armchairgeneral.com/maps/keymap/mapkey.htm* for a translation of the 1958 manual. The 1983 manual, translated by East View Cartographic, 1997, is in the British Library map room at shelfmark B3b(10).
8. These are 1:1 million N-29 *Ireland* dated 1969 and 1987; 1:500,000 N-31-B *Norwich* dated 1970 and 1985; 1:200,000 N-30-XXIX *Nottingham* dated 1967 and 1986; 1:100,000 sheet M-31-1 and others east of Greenwich dated 1964 and 1982.
9. Eastnor (see below) offer them on CD.
10. Known sheets cover land areas of M30 and M31 plus a few odd sheets in N31 and N30.
11. See under 'Compilation Information and Print Codes' for evidence.

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interval is 10m. Railway station symbols indicate the position of the station buildings, and county boundaries are shown.

Town plans

At least 80 British urban areas were mapped at 1:25,000 or 1:10,000 scale between 1950 and 1990. A list of known sheets and dates is appended.

Some towns occupy a single sheet, but many extend to two, three or even four. All have a comprehensive street gazetteer, extensive text description of the locality[12] and a numbered list of important buildings. In most cases this information is printed on the sheet itself, but in the case of Liverpool, London and Portsmouth a separate booklet was issued.

Town plans produced after 1970 are printed in ten colours; earlier ones are in four colours. Most plans are printed on large sheets, typically 900mm high by 1200mm wide and contain a staggering amount of detail. Contours are at 2.5m or 5m intervals with grid of 500m or 1km squares. Spot heights are shown to tenths of a metre. Most streets and localities are named, dimensions and paving material of major roads specified, tube stations are differentiated from railway stations and streams and rivers are annotated with their width.

However, the most striking feature is the attention given to buildings of potential strategic significance. These are depicted in great detail, colour coded, numbered and listed. Military establishments are coloured green, administrative buildings purple and industrial plants black. In some cases an asterisk is used to denote 'unknown type of production'. The Chatham, Gillingham and Rochester sheet shows details of the naval dockyard which were omitted from OS maps[13].

Interestingly, the vertical grid lines on the part of the London sheet east of Greenwich, in grid square M31, are offset from those on the equivalent smaller scale maps by some 250m. This is because the grid is based on the datum for M30 (west of Greenwich).

The London and Glasgow maps have supplementary diagrams of the respective underground railway systems. The London diagram contains one of the few errors so far detected in the entire map series; a non-existent line is shown linking Barbican and Angel[14].

The Dublin map is dated 1970 but, oddly, shows street tramways, although the city tramway system was abandoned in 1949. The same sheet shows the altitude of the summit of Howth Head as 169.2m whereas the 1:200,000 map indicates a height of 171m. OSI maps do not give a height.

One intriguing question concerns the towns missing from the list of known sheets. Surely places like Carlisle, Cork, Derby, Dundee, Hull, Limerick, Norwich, Perth, Peterborough, Reading, Slough and Stirling would have been of just as much interest to the Soviets. Did they simply not get round to them or could there have been many more maps than we currently know?

Compilation information and print codes

All maps carry some compilation information in the bottom right hand corner of the sheet. This sometimes consists simply of the year of production, but in many cases specifies scales and dates of declared source material. For example, 1:100,000 sheet M-31-13, London East, 1964 edition shows that it was partly derived from 1:50,000 material dated 1963 and partly from 1:63,360 material dated 1960-62. Presumably the former was an existing Soviet map (suggesting that a 1960s series did exist) and presumably the latter was the OS one-inch map. See below for more about source material.

The maps also have a print code. This comprises three parts, in the format B-99 XII-81 Д, where B-99 indicates map type and serial number; XII-81 indicates the month and year of production and Д indicates the print factory.

- map type codes are Ж - 1:1million, Е - 1:500,000, Д - 1:200,000, Г - 1:100,000, В - 1:50,000, И - town plan
- factory codes seen on the UK maps are Д, К, Л, Ср, Срт, Т. Д (Russian D) is Dunayev, the name of the main Moscow printing plant. The others have yet to be identified.

What sources were used?

This topic will be addressed in more detail in part two, but the short answer is everything from high technology to low skulduggery. Satellite images and high altitude aerial reconnaissance played a major part, but there was also a diplomat (who was not a cartographer) stationed in every Soviet embassy round the world whose job it was to collect all possible information, by fair means or foul. All available published maps, guides, directories and similar documentation were gathered and despatched to Moscow. Where these did not suffice, then illegal means such as bribery, theft or blackmail were used. Money, it seems, was no object.

It is also possible that pre-war German low altitude aerial photography (which is known to have existed and from which relief can easily be determined) was captured by the Soviets during WWII, but no tangible

12. See example for Birmingham at *www.fourone.com/mcp25.htm*.
13. More about map content and sources will appear in part II.
14. Thanks to Alan Cubitt for pointing this out.

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evidence exists.

Questions of copyright

USSR was not a signatory to the Berne Convention, so no copyright applied to the maps when they were produced. This was not an issue at the time, as even the existence of the maps was top secret. Russia signed up in 1996 but whether or not retrospective copyright applies has not been tested. The current Russian government sanctions the distribution and use of the maps generally, except for maps of scale 1:50,000 and larger of Russian territory.

Much of the remaining stocks of the original maps are held in Russia. They are generally released to dealers on demand, except in certain circumstances, such as military conflict or tension. For example, from 2002 distribution of 1:50,000 and 1:100,000 maps of China, Iran, Iraq and Afghanistan was suppressed[15].

Here, the Ordnance Survey declared in 1997 that the mapping *'is almost entirely an adaptation of Ordnance Survey Crown copyright material. It was produced without the permission of Ordnance Survey and thus it infringes Ordnance Survey's Crown copyright'*.[16] The British Cartographic Society queried this at the time[17], but the matter was not pursued. The OS confirmed in 2005 that this remains their position.[18]

American dealers advertise the Soviet maps of Britain as 'open source mapping'[19] or use the words 'where all other maps are copyrighted'.[20]

Where can you see them?

The British Library Map Library, Cambridge University Library Map Department and the Bodleian Library Map Room in Oxford all have examples of British and foreign maps and town plans. For all three libraries a reader's ticket is required to gain admission[21]. A summary of their holdings is appended.[22]Several dealers offer these maps on their websites[23], some as paper sheets but mainly in raster form. Most offer only complete sets of the smaller scale maps of whole countries at prices of several thousands of dollars. At least three map shops in former eastern Europe offer the maps: TopKart in Warsaw, Eastnor in Tallinn and Jana Seta in Riga[24]. The latter has stocks of paper sheets, including UK town plans, for sale at €2 each.

How were the maps produced?

The establishment responsible for Soviet mapping was ГУГК (GUGK, Chief Administration of Geodesy and Cartography). This vast organisation controlled map production factories throughout USSR producing military, topographic, economic and civil mapping.

Military mapping was produced by staff with very high security clearance at dedicated military cartographic printing factories including Moscow, Kiev, Tashkent, Leningrad, Irkutsk and Khabarovsk. The source material gathered by espionage or agents was collected in Moscow, where (usually) the maps were drawn and the printing plates created. Seven copies of the printing plates were distributed for security.

Although some factories did appear to concentrate on particular regions, it is probable that printing was undertaken at whichever factory had capacity at the time. The print runs were huge and the printed maps were distributed and stored at depots throughout the USSR (one in each of the 25 military regions). The depot for Kaliningrad, which included the entire Baltic region, was in Cēsis in Latvia. On occasions when capacity problems occurred, print production was carried out at the civil ГУГК plants, one of which (factory number 5) was in Riga in Latvia. As a matter of policy, a factory did not print maps of its own locality.

Civil maps produced by ГУГК for public use were drastically simplified and poorly pro-duced on cheap paper. Surviving examples can be bought for a few pence in the Jana Seta shop.

Conclusion

The Soviet military mapping project was evidently an enormously expensive and well controlled operation and it achieved spectacular results. Ultimately, futile, of course, if the purpose was world domination, but leaving a fascinating legacy for enthusiasts.

The author is deeply indebted to the following for valuable advice and information, for which he is very grateful: David Watt and staff at DGIA, David Archer, April Carlucci of The British Library, Anne Taylor of Cambridge University Library, Aleksander Lesment of Eastnor Ltd, Tallinn, Aivars Beldavs of Jana Seta Map Shop, Riga and Jānis Turlajs of Jana Seta Map Publishers, Riga.

From John Davies

15. Information from Aleksander Lesment at Eastnor.
16. See *www.cartography.org.uk/Pages/Groups/DesignG/Copyrit5.html* for OS statement.
17. BCS response is at *www.cartography.org.uk/Pages/Groups/DesignG/Arch_3.html*.
18. Letter to author, 14 January 2005.
19. East View Cartographic, *www.cartographic.com*.
20. Omni Resources, *www.omnimap.com*.
21. BL:*www.bl.uk/collections/maps.html*, CUL:*www.lib.cam.ac.uk/maps/Home.htm*, Bodleian Library:*www.bodley.ox.ac.uk/guides/maps/*.
22. Each of the three libraries holds all the known British 1:50,000 sheets as well as the town plans noted in the appendix. BL and CUL both have complete coverage of UK at the four smaller scales. All three also have a collection of foreign maps and town plans.
23. As well as East View Cartographic and Omni Resources, see *www.geopubs.co.uk* and *www.fourone.com*.
24. For TopKart see *www.topkart.com.pl*; for Eastnor, contact Aleksander Lesment on *lah@hot.ee*; for Jana Seta *www.kartes.lv/eng/3100_news.php* or contact Aivars Beldavs on *aivarsb@kartes.lv*.

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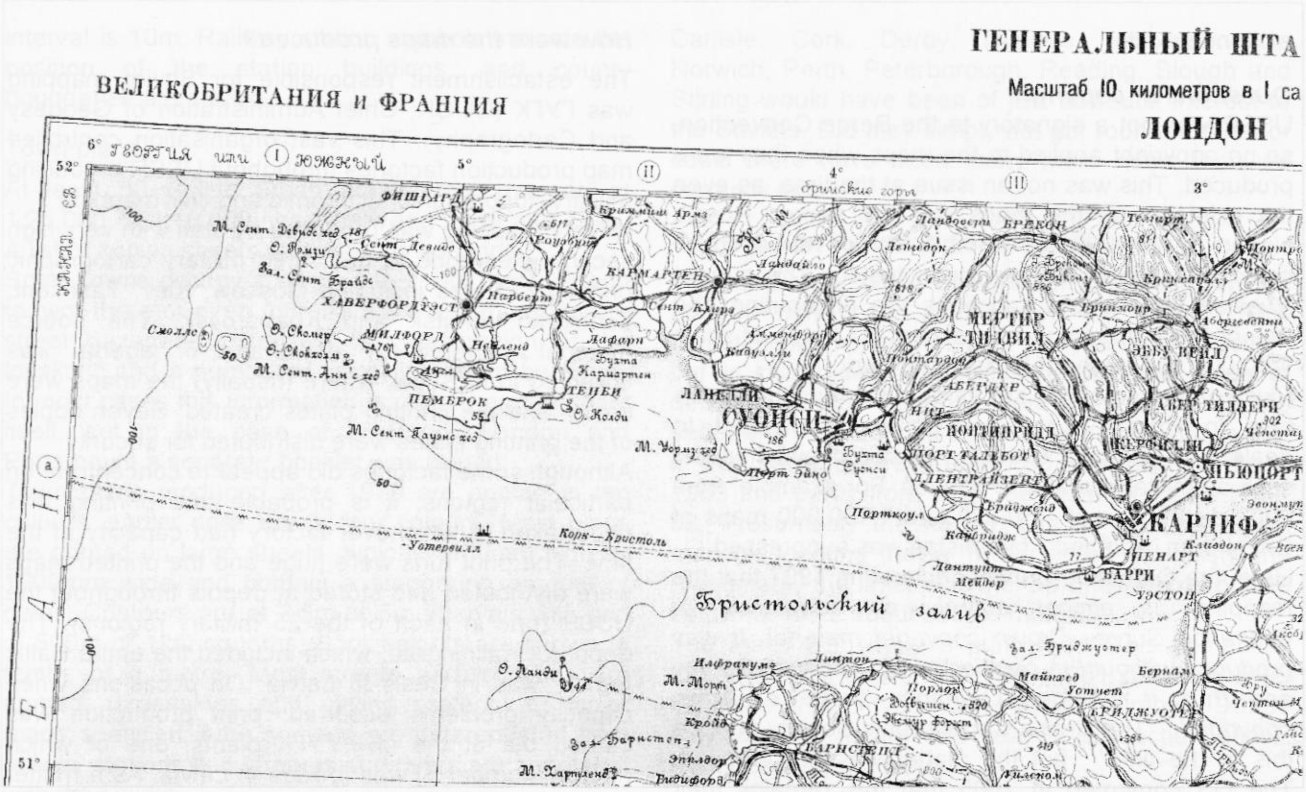
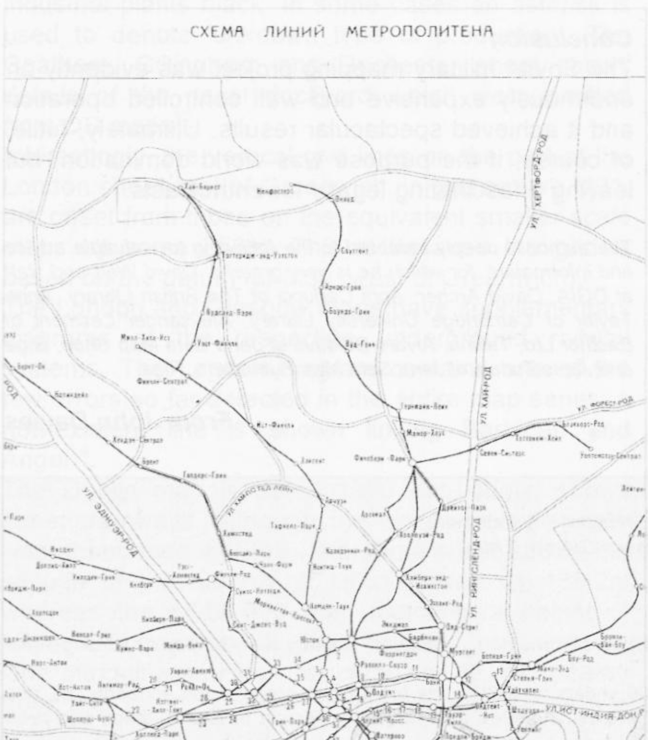


North western corner of 1:1 million sheet M30 at 52˚ N 6˚ W. This is dated 1938 and is printed in three colours with ornate script for marine features and names. The map boundary is not parallel with the sheet edges on maps of this scale due to the curvature of the earth. An undersea cable links Croyde with Lundy Island and a transatlantic cable runs from Weston super Mare. The shipping route is labelled Cork-Bristol. County boundaries are shown.



Part of the diagram titled 'Plan of subway lines' which is included as a fold-out sheet, size about 36cm by 56cm in the gazetteer booklet provided as part of the 1:25,000 London plan. An inset table lists the station names which appear here as numbers. This wrongly shows a line connecting Angel and Barbican stations.

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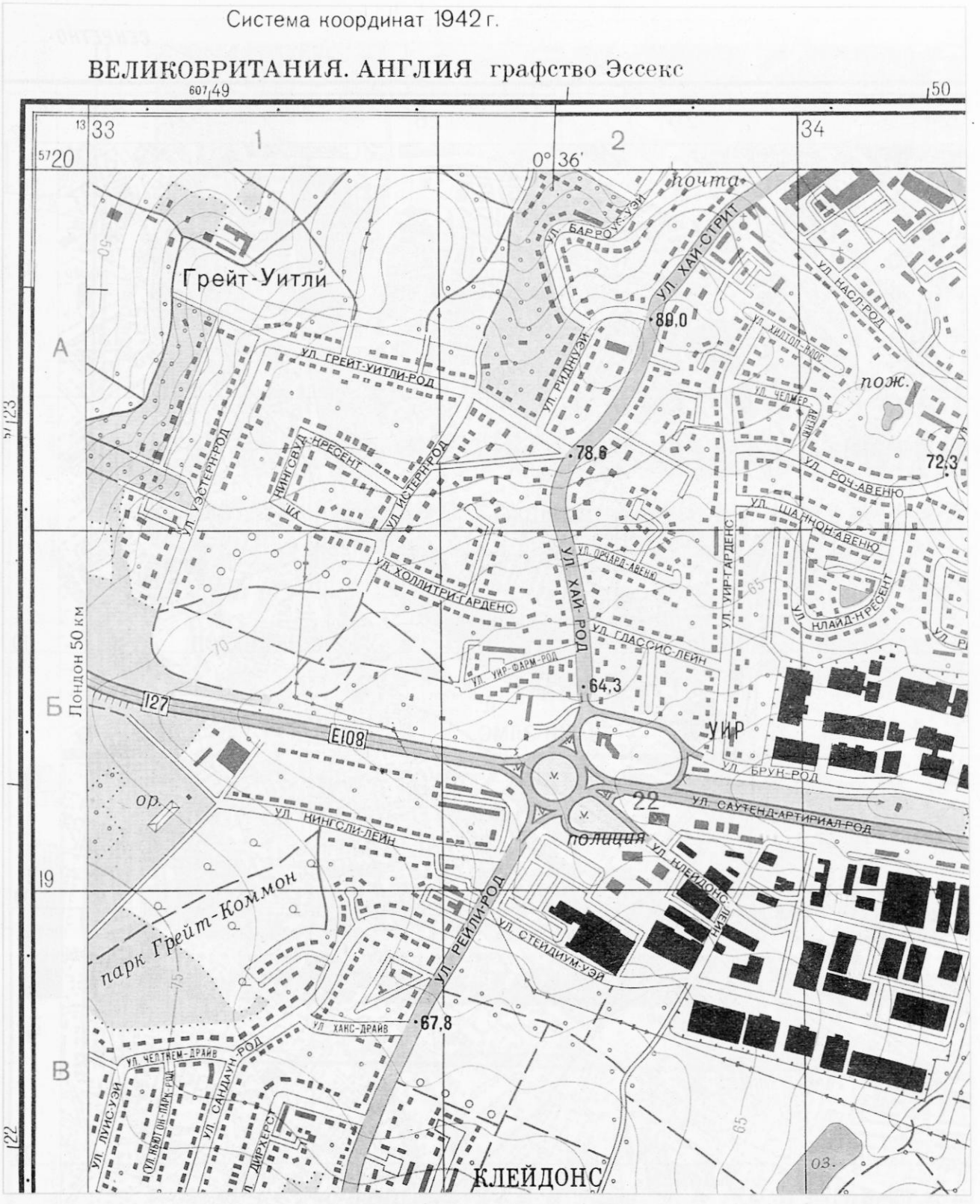

Part of 1:10,000 plan of Southend-on-Sea. The A127 dual carriageway road is named as 127 and E108, with London shown as 50km distant. Spot height of 64.3 is shown just north of the roundabout and the building east of the roundabout, numbered 22 is listed in the key as a police station. Just east of this and north of A127 an arrow indicates stream direction. Contours are at 2.5m intervals and the grid squares are 500m. Legend along the top reads 'System Co-ordinates 1942' (this refers to the Pulkovo 1942 datum used as a base for the Gauss-Krüger projection). Below that is 'Gt. Britain England county Essex'.

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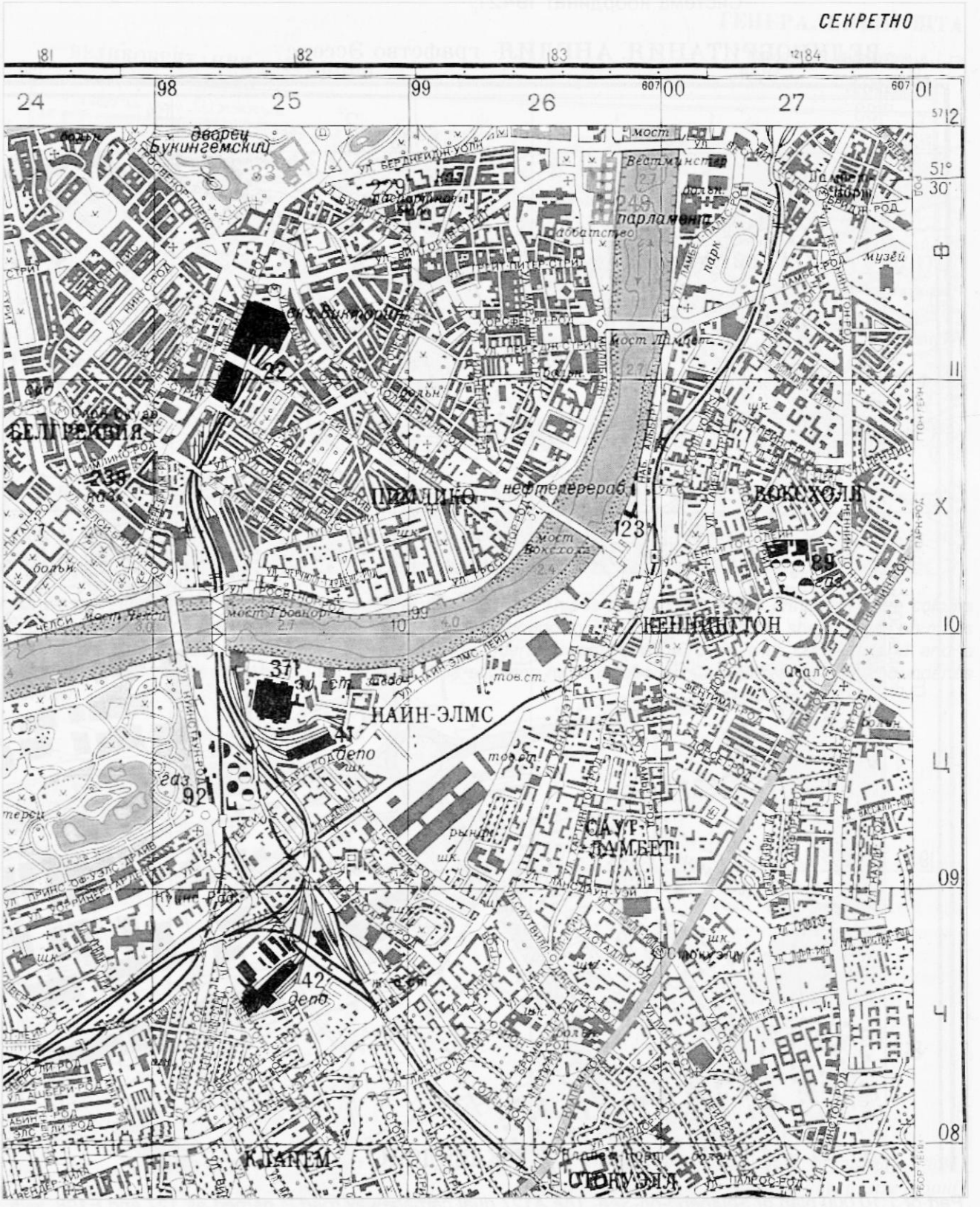

Part of 1:25,000 plan of London. СЕКРЕТНО is 'Secret'. Arrows in square 26Ф indicate that the river flows north and has tidal flow from the north. Submarine contours and low water markings are shown. Among the many annotated buildings are Houses of Parliament (249), Battersea power station (37) and Chelsea barracks (239). The M symbol by Victoria station indicates metro (tube) station.

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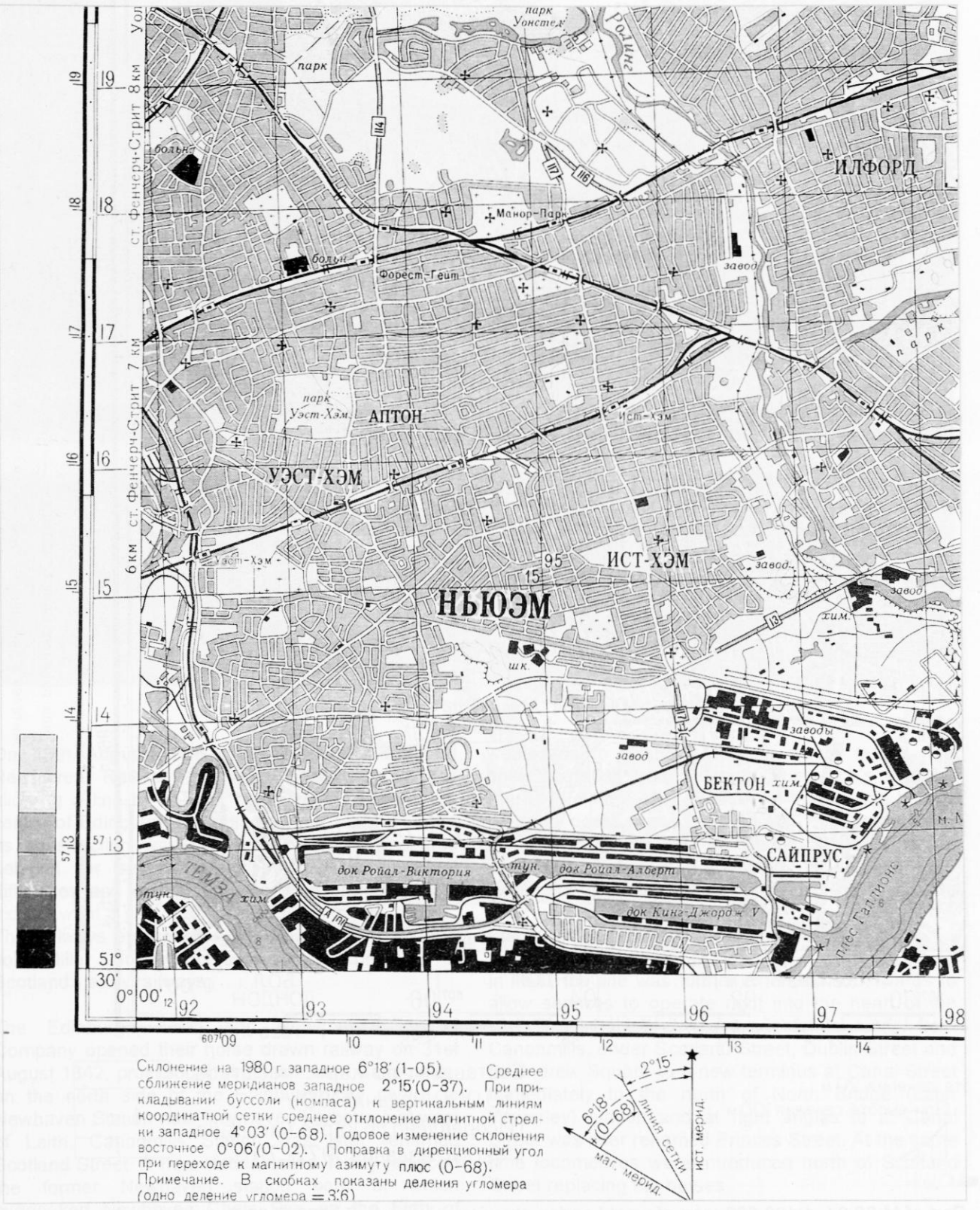

Part of M-31-13-A, 1:50,000 map of east London showing the six colour print registration blocks. The railway station just below the name УЭСТ-ХЭМ (West Ham) at grid ref. 931155 has the station buildings positioned to the north side of the line. The star symbols by the river are navigation lights.

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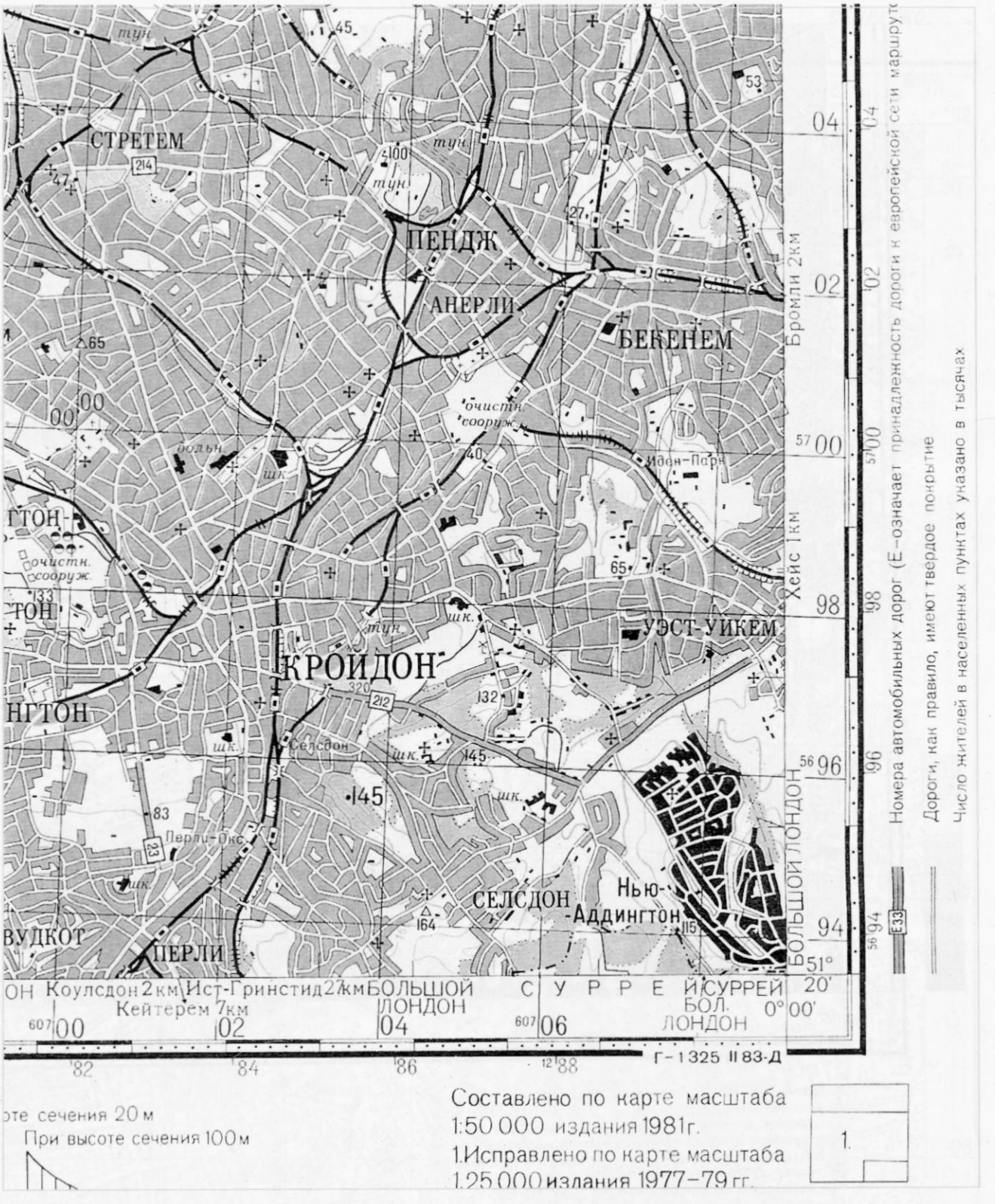


Part of M-30-24, 1:100,000 map of west London showing print code Г-1325 П 83 Д, indicating production in Feb 1983 at the Dunayev factory. Below that is 'Compiled from map scale 1:50,000 published 1981, updated from map scale 1:25,000 published 1977-79'. The spot height 145 on the hill, square 02,94, below the name КРОИДОН (Croydon) is in large type as it is at a highest point.

Scotland Street Tunnel

The North portal of Scotland Street tunnel - photo by Nick Catford

On 13th August 1836 the Edinburgh Leith and Newhaven Railway Act received Royal Assent allowing a line to be built from Canal Street in the centre of Edinburgh to Trinity, on the Firth of Forth. Its construction was beset by problems and was delayed for several years because of financial difficulties and objections from local residents who did not want a gas-lit tunnel underneath their homes. The railways engineers were Thomas Grainger and John Miller who had previously worked on many of Scotland's early railways.

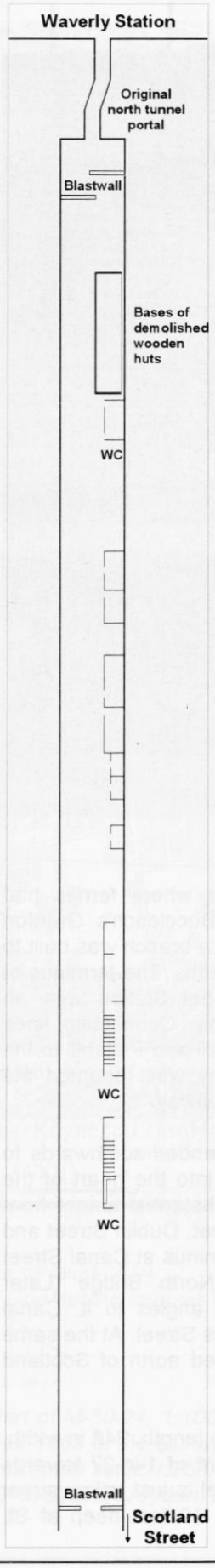
The Edinburgh, Leith and Newhaven Railway Company opened their horse drawn railway on 31st August 1842, providing a direct link from Canonmills, on the north side of the Edinburgh city centre to Newhaven Station near Newhaven harbour, just west of Leith. Canonmills Station was later renamed Scotland Street. A new station called Trinity replaced the former Newhaven station both of which overlooked Newhaven Chain Pier on the Firth of Forth, a popular location for early morning bathing in the 19th century.

On 19th February 1846 the line was extended westwards to Granton Harbour where ferries had been operating from Duke of Buccleuch's Granton Pier to Fife since May 1838 and a branch was built to the busy docks at the Port of Leith. The terminus of the Leith branch was at Citadel Station with an intermediate stop at Bonnington. Connecting lines were later also added to Abbeyhill and Piershill to the south. At this time the company was renamed the Edinburgh, Leith and Granton Railway

In 1847 the line was further extended southwards to allow services to operate right into the heart of the city. This involved driving a substantial tunnel from Canonmills, under Scotland Street, Dublin Street and St Andrew Square to a new terminus at Canal Street immediately to the north of North Bridge (Later Waverley) station and at right angles to it. Canal Street was later renamed Princes Street. At the same time locomotives were introduced north of Scotland Street replacing the horses.

The tunnel measures 1000yds in length, 24ft in width, and 24ft in height with a gradient of 1-in-27 towards the north. The roof of the tunnel is just below street level at Scotland Street, but is 49 feet deep at St.

Scotland Street Tunnel



Andrew Street and 37 feet deep under Princes Street. In order to cope with the steep gradient, cable haulage was required, with a stationary winding engine at Canal Street. Passenger carriages proceeding downhill were steadied by brake trucks, while those heading uphill were hauled by an endless rope, which ran under rollers beneath the rails and was powered by the engine at Canal St. Station. A second shorter tunnel on the north side of Cannonmills took the line under Rodney Street and Broughton Road.

Robert Louis Stephenson wrote of the tunnel, "The tunnel to the Scotland Street Station, the sight of the trains shooting out of its dark maw with the two guards upon the brake, the thought of its length and the many ponderous edifices and open thoroughfares above, were certainly things of paramount impressiveness to a young mind. It was a subterranean passage, although of a larger bore than we were accustomed to in Ainsworth's novels and these two words, 'subterranean passage,' were in themselves an irresistible attraction and seemed to bring us nearer in spirit to the heroes we loved and the black rascals we secretly aspired to imitate."

On 27th July 1847, the Edinburgh, Leith and Granton Railway was purchased by the Edinburgh & Northern Railway who introduced the worlds first railway ferry on 3rd February 1850, with goods wagons running onto the ferry crossing the Firth of Forth where they continued northwards on a new line to Burntisland in Fife. Soon afterwards the line became part of the Edinburgh & Northern route to Dundee, connecting with ferries over the Tay with ownership passing to the Edinburgh, Perth and Dundee Railway.

In 1862 the line was absorbed into the North British Railway who built a new line to Abbeyhill and Trinity allowing trains from Trinity to be diverted into Edinburgh Waverley (renamed from North Bridge in 1866) from 22nd May 1868. On this date, both Scotland Street and Princes Street closed to passengers. Scotland Street remained in use as a goods and coal depot, accessed only from the north.

In 1923, the North British Railway became part of the London & North Eastern Railway. The LNER were quick to close loss making lines withdrawing passenger services between Edinburgh Waverley - Granton Harbour on 2nd November 1925 despite local protests.

During WW2 the tunnel was used as an air raid shelter serving parts of Central Edinburgh. The LNER also used the tunnel as its wartime emergency headquarters, building a series of brick and wooden buildings in the northern end. Because of the natural protection afforded by the tunnel it was eminently suitable to house a protected control centre comprising a traffic office with centralized traffic control. The traffic controller had telephone links to all signal cabins, goods yards and major stations and offices. There are no facilities for remote operation of signals etc., orders being given from office to signal cabins; military liaison staff would also be present.

Scotland Street tunnel was one of 10 hardened emergency control centres built by the LNER during WW2, others were at:

- Knebworth - In the goods yard north east of station; this was demolished and replaced by a new bunker in the 1950's. This in turn was demolished in the 1980's and the site is now lost under housing.
- Bawtry - In the goods yard north west of station; this was demolished c. 2002 and the site is now lost under housing.
- Gerards Cross - located on the north side of the line about quarter of a mile west of the station in a deep cutting. The building was demolished many years ago
- Shenfield - East of station between the Colchester and Southend lines. The building was used by British Railways as offices until 1968. The building was sold to the present owners in 1972 and for some years was used as their company headquarters but is now leased out as offices. The building has been maintained in good condition with the blast shutters over the windows

Scotland Street Tunnel

Platform 19 at Waverley Station seen from the tunnel under Waverley Market - Photo by Nick Catford

being restored. Internally the building has been modernised but externally there are few changes altered except a 2nd storey has been added on top of the slab roof. The picket post survives at entrance.

- East Leake - In the goods yard north east of station, the site is now lost under housing.
- York - Built into city wall and later used as a headquarters by British Railways Board. The bunker is still intact and used as a store but the only external evidence is a door in a bank.
- Norwich - Position unknown, assumed demolished.
- Metheringham - In the goods yards adjacent to the station. The brick building is still extant.
- Ipswich - Just east of Ipswich tunnel portal by the southbound platform. The building had been demolished by 1997 and the site is now a car park.
- Godley Junction -. Located on the north side of station on the Woodhead line next to engineers depot. The whole area was cleared in 1980's.

All the protected control centres were dispersals for normal peacetime traffic offices, i.e. Liverpool Street moved to Shenfield, Kings Cross moved to Knebworth and Edinburgh Waverley moved to the Scotland Street tunnel etc.

A country mansion, The Hoo, at Whitwell (near Hitchin, Hertfordshire), served as the wartime headquarters for the Chief General Manager of the LNER. The house which was used by the British Railways Board as offices and a training centre until 1968, it was demolished in the 1980's and replaced by apartment blocks.

After the war, the railway control centre in Scotland Street tunnel was kept on care and maintenance. Some of the WW2 railway controls had their communications refurbished in about 1951/52 and it seems likely that this would have happened at Scotland Street, as it would have been considered a priority site.

In the 1950's, the British Railways Board planned a network of new Emergency Control Centres, but only 4 out of the proposed 30 were built with the rest of

Scotland Street Tunnel

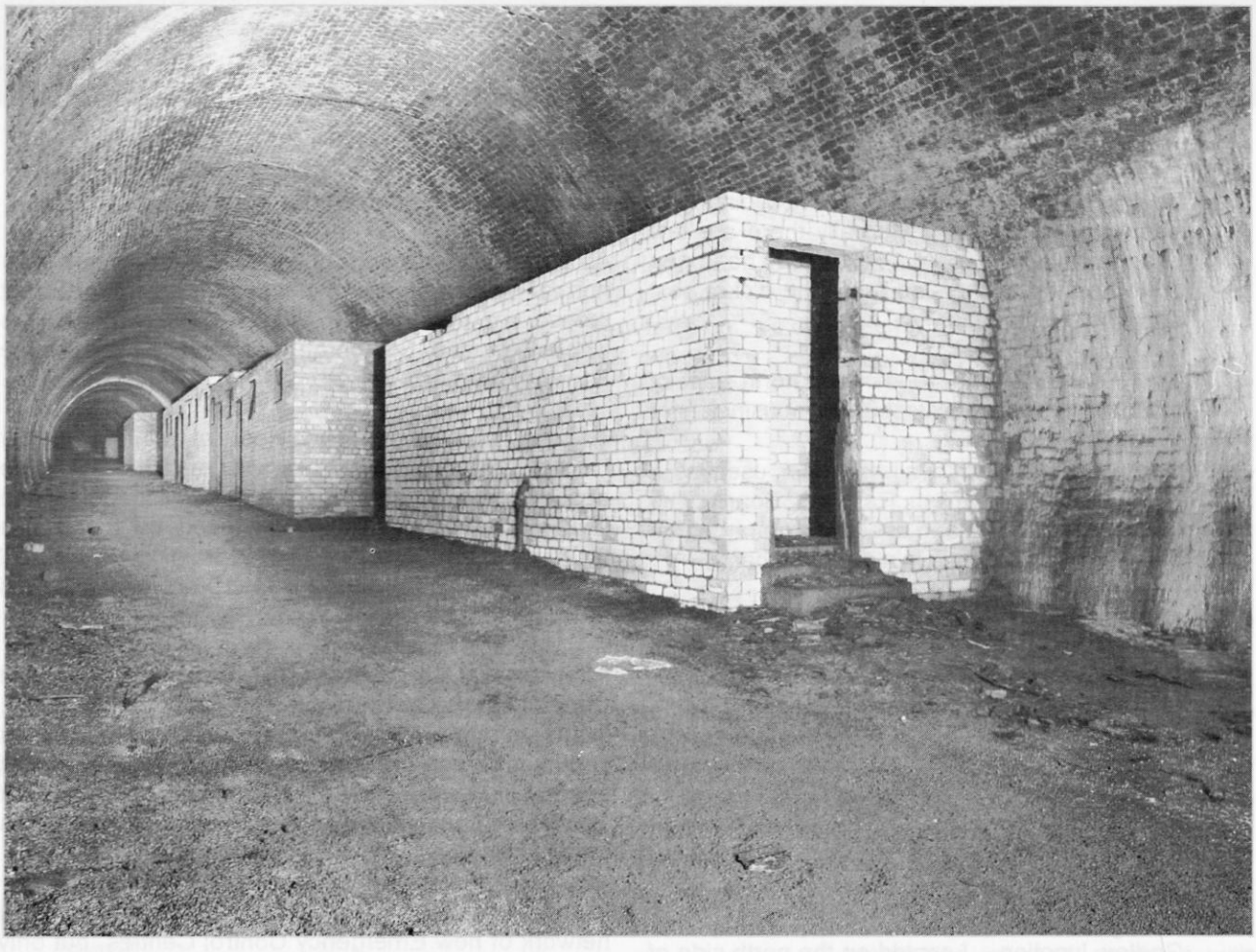
Warden's Post sign in Scotland Street Tunnel - photo by Nick Catford

the bunkers shelved in 1956. Those built were at Burntisland, Brickett Wood, Knebworth and Huyton Junction.

The Burntisland Control Centre was under construction in 1956/7, replacing Scotland Street. Although built, it was never fully commissioned and in 1957 work on the whole project was abruptly stopped and the British Railways Board set up a series of mobile controls instead. The building at Burntisland is a 40' X 120' flat roofed single storey blockhouse; it is still extant and now houses a diving shop.

Scotland Street Yard continued to operate as a coal depot and one track was retained at the north end of the for storing railway wagons. The coal depot closed in 1967 and the track was lifted shortly afterwards. In the1970's the tunnel was used for growing mushrooms and Cochranes Garages Ltd leased the north end to store vehicles. It was also used as a location for monitoring natural radiation

A number of schemes for using the tunnel have been mooted since the 1970's, including a new emergency centre for Edinburgh City Councils, which was quickly rejected in the early 1980's. In the in the 1990's there was a proposal to site a giant boiler inside the tunnel to generate power for the city centre and in recent years there have been proposals to use the tunnel as an underground car park and to reopen it for a new light railway or busses.



Looking south along Scotland Street Tunnel, the building in the foreground is a toilet block with the LNER emergency control centre located in the buildings beyond - photo by Nick Catford

Scotland Street Tunnel

Rodney Street Tunnel in 1904 - Photo from John Alsop collection

Scotland Street coal depot in January 1967, the north portal of the tunnel can be seen to the right. - Photo by John Hume

Scotland Street Tunnel

The south entrance to Scotland Street tunnel seen from Platform 19 of Waverley Station - Photo by Peter Stubbs

The site of Canal Street Station (NT260740) is now lost under Waverley Market and Waverley Station. The station had curving platforms from the north to the west and a junction was later formed with the new lines running east-west through Waverley station which faced west.

The site of Scotland Street Station (NT254747) goodsyard is a playground and the platform area has been leveled and made into parkland. The portals of the tunnels at either end of the station can still be very clearly seen flanking either side of the playground.

The impressive stone built south portal of Scotland Street tunnel is in good condition.
It has been bricked up, probably during WW2 with a gate for access, this is securely locked. There is some evidence of ventilation plant just inside the tunnel portal behind the brickwork.

When the tunnel was visited by members of the Grampian Speleological Group in July 2001, there was about 18" of water just inside the portal but the tunnel was dry when visited by members of Subterranea Britannica in October 2006.

The tunnel is u-shaped in section initially sand stone lined but then brick lined running at an incline all the way to Waverley. There are a number of walls built across the tunnel with a square doorway in the centre, no evidence of wooden doors remain.

The middle section of the tunnel is wet with water running down the walls and long straw stalactites hanging from the roof with further calcium carbonate (flowstone) deposits covering the walls and floor caused by actively running water.

At the southern end of the tunnel, a number of brick buildings survive. The first buildings encountered along the west side are toilet blocks, presumably male and female which were built when the tunnel was used as an air raid shelter, these include urinals and longs lines of cubicles some still retaining wooden seats with an oval hole under which would have been a chemical toilet (Elsan). On the opposite wall there are two wooden signs indicating 'Warden's Post No. 10' and 'Warden's Post No. 11'.

Scotland Street Tunnel

The 1950's emergency railway control centre at Burnisland build to replace Scotland Street - Photo by Nick Catford

Beyond the toilet blocks there are a number of larger brick buildings some divided into rooms. These were the offices for the railway control centre. All the buildings have been stripped of any fixtures and fittings although one room still contains a sink. Beyond the buildings are the bases of a number of wooden huts which have been demolished or have rotted away.

Beyond a staggered blast wall the tunnel has been blocked. It is unclear if this was at the southern portal or if the southern end of the tunnel was demolished during the construction of the Waverley Market above. Access and ventilation has been maintained through this area along a circular corrugated iron tube underneath Waverley Market. This runs for about 50 yards through a dog leg to a gate in the wall opposite Platform 19 of Waverley Station. Above the gate the inscription 'Site of the original Edinburgh - Leith - Newhaven Railway' can be seen from the platform.

The southern portal of the tunnel under Rodney Street at the opposite end of the children's playground is open but there are railings up to head height to prevent access.

From Nick Catford

Sources:

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Israelis put nuclear bunkers in gardens

AMID mounting fears that Iran is planning to obliterate their country, wealthy Israelis are shelling out on underground nuclear shelters in the gardens of their luxury homes.

The shelters, which cost at least £60,000 for a bargain-basement version, are built to withstand radioactive fallout, have fortified walls and doors and generate their own electricity and decontaminated air.

Defence experts estimate that hundreds of such bunkers, many fitted with all modern conveniences such as bedrooms, kitchens and bathrooms, have already been built in private homes across the country and demand is soaring.

Zaki Rakib, a wealthy businessman, built a shelter for himself and his family under his large villa overlooking the Mediterranean in Herzliya, an exclusive garden suburb north of Tel Aviv.
"The shelter looks like a regular flat," he said. "It is 2,000 square feet, with a living room, two bedrooms, kitchen, self-powered electricity."

Rakib's post-nuclear pad, which can accommodate more than 25 people for two weeks, cost about £250,000. "The difference between an atomic shelter and a regular one is in the technical components: the thickness of the walls and a special system to block radioactive fallout," he said.

Leading the stampede to the nuclear bunker is Shari Arison, the country's wealthiest woman, estimated to be worth about £2.7 billion. The Israeli media have reported that she has already made preparations for Armageddon by building two sophisticated underground structures. One is at her home in Tel Aviv, the other in the garden of her holiday villa in Bnei Zion village.

Firms specialising in the manufacture of such shelters are booming. Ahim Torati is a company producing parts for atomic shelters. "We supply components for decontaminated air, fortified doors and walls," said Menahem Torati, its owner.
"If in a regular shelter the door should withstand a five-ton blast, the door of an atomic shelter should absorb 250-270 tons."

Seeking to allay public fears, the government insists that the population has little to fear. "We are aware of all these panicky people building atomic shelters. They're wasting their money," said a security source.
"Israel will not allow Iran to build an atomic bomb, and even if it did, the Iranians know very well that we'll bomb them back to the Stone Age before they've launched a single missile."

However, the government is quietly updating its preparations for a possible nuclear strike. Ephraim Sneh, the deputy defence minister, confirmed that a £300m nuclear shelter is being constructed in the Jerusalem hills for the Israeli war cabinet. "This will be a command and control centre that will be able to run the state of Israel during a war, even after a nuclear strike," he said.

Israelis are used to coping with the threat of war, but until recently the civilian population has been largely unaffected by conflicts beyond the country's borders. The 34-day invasion of Lebanon last summer, however, brought war closer to home. Up to 250 Hezbollah missiles rained down on Israel every day. Millions of terrified Israelis spent the hottest weeks of the summer in shelters.

Iran's increasingly bellicose rhetoric is fuelling fears that the next war could bring even more devastation. President Mahmoud Ahmadinejad has stated that Israel should be "wiped off the map". As well as developing nuclear technology, Tehran boasts long-range ballistic missiles capable of hitting any target in Israel.

Many Israelis no longer trust their government to protect them. One man building a £60,000 nuclear shelter in his Tel Aviv garden said: "After the Lebanon war, I concluded that I have to protect my family, as I'm not sure the state will be able to do it."

While the well-off are calling in the builders, nearly one third of the country's population have no protection even against conventional weapons. "If Tel Aviv were attacked today, you can expect thousands of casualties," predicted one security expert.

From Uzi Mahnaimi, Tel Aviv

A Bank Holiday in the DDR.

Cameron emerging from a former Soviet nuclear warhead store - Photo Mike Barton

With the bank holiday looming and the thought of DIY projects and madness on the roads, I decided to leave the country; myself and my son, Cameron decided a weekend around Altenburg in the former East Germany would be far enough away.

I had heard there was a military vehicle show in nearby town of Torgau, the spot on the Elbe River where the Red Army and the Americans met up at the end of the Second World War in the spring of 1945.

We planned to visit the military vehicle show and have a look around the former Russian airbase, then called Nobitz, now called Leipzig – Altenburg Airport (some 50 km south of Leipzig) and the destination of our cheap Ryanair flight from Stansted.

An email to Sub Brit's German bunker guru, Mike Barton, with a request for information on the area, got me lots of information and the offer of a guide for the day, in the end it turned out to be both Mike and a local historian Werner Weisse. Werner had been involved in the "ABM" job creation scheme that came into force after the Soviets left with the aim of clearing up the mess they had left behind (strongly denied, of course) and stripping the barracks and military facilities which now stood vacant,

We arrived on the Saturday evening flight from Stansted, it was a strange experience landing at a former Soviet air force base, complete with many hardened aircraft shelters, one with a restored MIG 21 still in situ, the runway is still the original multi-segment concrete and all around are remnants of the past.

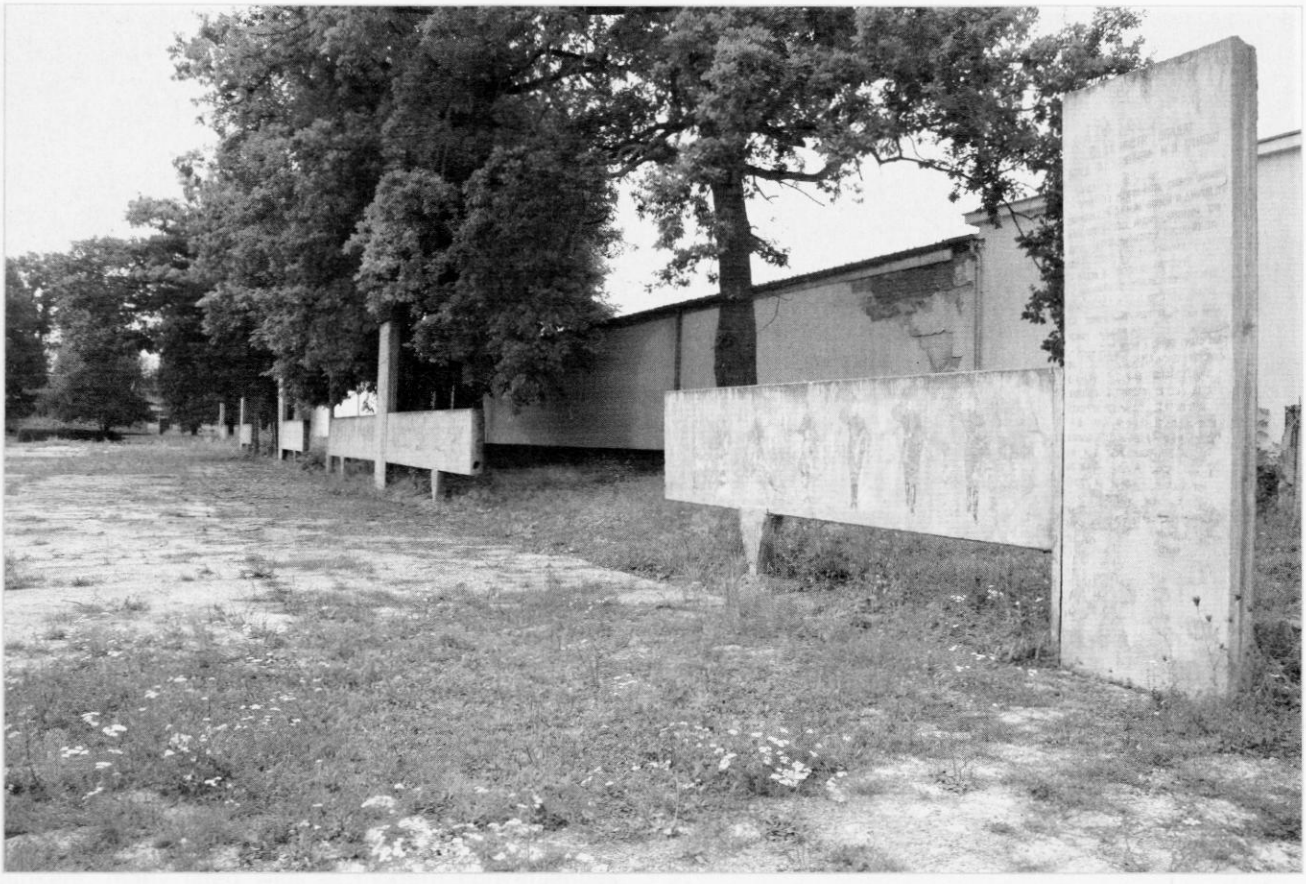
The main terminal building is a very small, modern wooden segment-type building, which sits on the old flight line; the airport serves two passenger flights a day from Stansted, and has a busy private flying club on site.

After collecting our hire car we drove the 10km into Altenburg and checked into our hotel, after an excellent meal, we discussed the plan of action for the following day. Mike and Werner had lots up their respective sleeves and our 50 km drive to the military vehicle show in Torgau would have to be postponed until next year.

Our first stop on a bright sunny Sunday morning was the former munitions works of HASAG (Hugo Schneider Aktiengesellschaft-Metalwarenfabrik, Leipzig)

HASAG was one of the privately owned German industrial companies that manufactured armaments

A Bank Holiday in the DDR.



The former parade square at the Soviet airbase, Nobitz - Photo Dan McKenzie

in the Second World War and was the third largest company after I.G. Farben and the Hermann Goring Werke. The massive site is now partly used as an industrial estate and partly abandoned, in GDR times it became a washing machine factory. We first visited a munitions storage area, with large banks all around to stop any blast affecting munitions stored nearby.

We then went on to an underground firing range, the range was used to test the munitions produced in the factory. The entrance to the range is hidden in the undergrowth behind one of the many unused buildings.

We entered the range down a set of stairs now covered in wood and rubbish, the staircase we used takes you into the butts end of the range via two small rooms, the range itself is 50 meters long and 5 meters wide, firing took place through embrasures from a room of about 13m x 6m. Beyond this room is a further room used for preparation and then comes the main entrance stairs, which are now sealed. The range has been totally stripped with only small amounts of iron work remaining, It is wet and muddy underfoot, with drains in the floor overflowing with rain water.

We then drove to the main office block for the site, and had a look externally, the building is now being used as office space.

From the HASAG factory we travelled the 10 km back to Nobitz air base or Altenburg as its now called, our first stop was at the site of the main command bunker, the bunker has been removed and a new factory and offices built on the site, only the original gate, with Soviet graffiti, and a couple of vehicle hides survive. This part of East Germany was one of the first places to be vacated by the Soviets, due to its close proximity to the Inner German border and West Germany. This has given the Thuringian authorities greater time to clear the remnants of the Soviet military.

We then moved on to the airfield museum, which charts the history of the airfield from its inception as a military training ground in 1881, the first airfield in 1913, its use as a training airfield by the Luftwaffe in both world wars and its use as a Soviet fighter base from 1945-1991. The museum has displays on all of the history with one room being dedicated to the Soviet airbase. All the displays are captioned in German, but with lots of photos, artefacts and even a complete MIG 21 aircraft, it's still enjoyable.

After a coffee and a cake in the museum café, we

A Bank Holiday in the DDR.

The nuclear warhead store adjacent to the Soviet airbase at Nobitz - Photo Dan McKenzie

headed out to the former parade square, where we found a perimeter wall with murals and instructions on drill movements all around the square, some sections had been removed as the concrete was cracked and damaged. Unfortunately, the murals themselves are in poor condition after being exposed to the weather for many years.

The main station headquarters backs onto the parade ground; it was securely locked but appeared to have a large basement with more recent Soviet vehicle access, the ramp down was so steep the Soviets had fitted pieces of tank track for increased grip on the way in and out.

We visited the original German guard room, open and abandoned; it had been used by the Soviets as a guard room and a jail. We walked to the original German control tower; which has been renovated to a high standard and is now used as the base for the flying school.

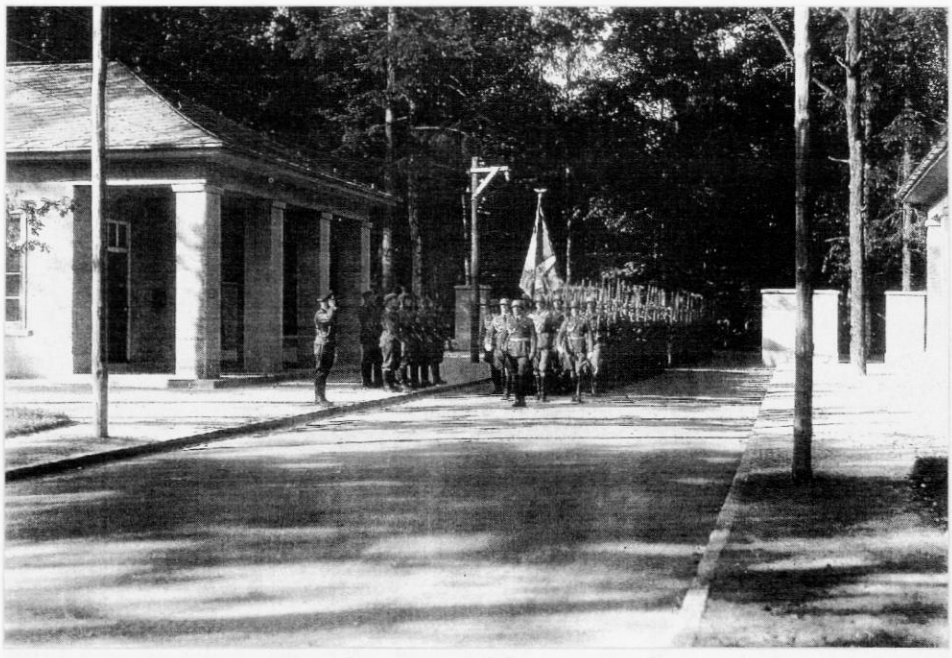
On our way back to the car we spotted what appeared to be the entrance to a bunker, it turned out to be the entrance to one of the site's underground fuel dumps. We were told it contained a chamber with access to storage tanks on each side. The tanks were used up until the Soviets left the site in 1991; we were unable to enter as it's now flooded to the top of the stairs.

We left the site of the airfield proper and drove a few hundred meters to the former officers' mess, now hidden in ever encroaching woodland. The building is open and has been extensively vandalised. The mess is made up of two buildings - an original German building, which would have been very impressive with its wooden panelled walls and thick marble floors. To the right of the building is a Soviet extension, which was a large auditorium, now stripped and open to the elements. To the front of the building was a plinth, on which was mounted another MIG 21, now removed.

We then visited the airfield main communications building, built by the Soviets; semi-sunk, and designed to look like a simple boiler house, with a very large chimney. Internally nothing much remains, lots of chopped off cables enter the site, giving a clue to its former use.

Just down the road from here, we visited our first proper bunker; a single set of stairs lead down to two underground rooms, our excitement was dampened when we were told it was used to store potatoes, "The Kartoffel Bunker"!!

A Bank Holiday in the DDR.



The former main gate of the Luftwaffe base at Nobitz -Then and Now!

The next site was the airfields nuclear warhead bunker, hidden deep in the woods. The site has again been extensively cleared with all surface buildings having been removed. However there is still access to the bunker. We entered through a gap into the main personnel entrance tunnel, our first impressions were how complete the bunker was, very little had been stripped out, this is not usual for Soviet bunkers, the first door on the left after the multiple blast doors was the generator room, all complete, minus the generator, on a mezzanine above was the extensive cooling plant for the generator. Moving further into the bunker we found the electrical switch room, again, mostly complete, the compressor room for the overpressure system, complete with compressors and large upright storage tanks, water treatment rooms, air handling plant again all complete, passing down the corridor we found a dumb waiter type lift in situ. At the far end of the bunker is the large storage room which held the munitions, this has been filled with concrete rubble up to a height of about two meters, it was possible to climb onto this and access further areas of the bunker, a storage room and the main access to the site, now sealed from the outside. Returning to the main corridor we climbed a ladder to the upper floor, again full of air plant, plant rooms, filter rooms and the main monitoring and control room. We found other rooms which seemed to contain fume cabinets.

After an hour of exploring and photographing the site we left the bunker and headed to the next site. Now totally sealed, we visited the chemical weapons storage bunkers, completely covered and inaccessible. This was the final site of the day for us as our two guides had to leave us, one to return to his dogs, the other to his wife.

After bidding them both farewell, we decide to go and have a look at the nearby Colditz castle, it was late in the day and by the time we had travelled the 30km to the castle and it was closed, we retraced our steps and returned to our hotel for a hot shower, a hot meal and a cold beer.

After breakfast we drove back to Altenburg airport, this time as travellers not as explorers, and boarded our lunchtime flight back to the UK. A very interesting weekend without any traffic jams or DIY!!

My thanks go to Mike Barton and Werner Weisse for guiding us around.

Dan & Cameron McKenzie

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